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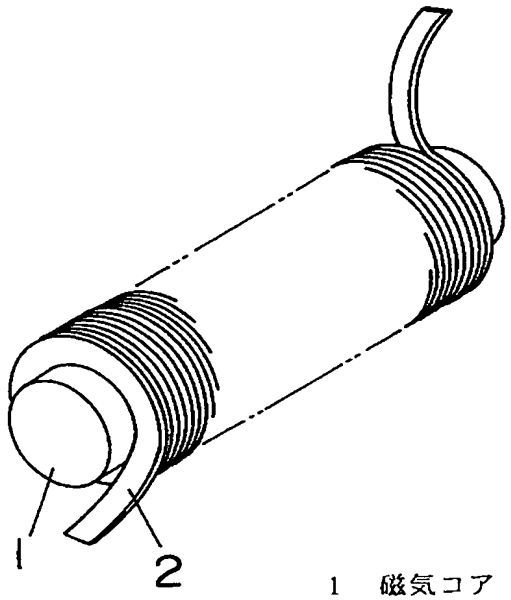
(54)【発明の名称】　電磁装置及び高電圧発生装置

(57)【要約】
【課題】薄型で優れた性能を有する電磁装置及び高電圧発生装置を提供する。
【解決手段】磁気コア１は抵抗率（固有抵抗）が大きいＮｉ－Ｚｎフェライト材を用いて円柱状に形成される。また、巻線は平角導線２を磁気コア１のほぼ全長にわたって一層にエッジワイズ巻することで形成される。抵抗率の大きい材料で形成された磁気コア１に平角導線２を直接エッジワイズ巻して電磁装置を形成することにより、磁気コア１と巻線（平角導線２）との間にコイルボビン６０等の絶縁物が不要となって、巻線の外形を小さく且つ薄く形成して電磁装置の薄型化が図れる。また、磁気コア１に平角導線２を直接巻回しているため、巻線の全長が短くなって巻線抵抗を小さくすることができる。さらに、磁気コア１と巻線との間に空隙が生じないから、例えば同寸法及び同巻数で比較したときに自己インダクタンスを小さくすることができる。



1　磁気コア
2　平角導線

【特許請求の範囲】
【請求項１】　抵抗率が１０００Ω・ｍ以上の特性を有する磁気コアと、磁気コアの全周にわたって略当接して巻設される巻線とを備え、平角導線を磁気コアに直接エッジワイズ巻することで前記巻線を巻設したことを特徴とする電磁装置。
【請求項２】　前記巻線の上に他の１乃至複数の巻線を巻設したことを特徴とする請求項１記載の電磁装置。
【請求項３】　磁気コアに略当接して巻設された前記巻線と当該巻線の上に巻設された巻線の被覆同士を融着したことを特徴とする請求項２記載の電磁装置。
【請求項４】　磁気コアの表面を粗い仕上がりとしたことを特徴とする請求項１又は２又は３記載の電磁装置。
【請求項５】　複数のリード間に平角導線がエッジワイズ巻された磁気コアを配置し、前記リード同士を接合したことを特徴とする請求項２記載の電磁装置。
【請求項６】　筒形に形成され平角導線を巻回した前記磁気コアが挿着される第１の絶縁部材と、第１の絶縁部材の外周面に形成される溝に導電性樹脂を埋めて形成される巻線と、第１の絶縁部材の外周を覆う第２の絶縁部材とを備えたことを特徴とする請求項２記載の電磁装置。
【請求項７】　平角導線からなる前記巻線を２次巻線とし、前記第１の絶縁部材の外周面に形成される巻線を１次巻線としたことを特徴とする請求項６記載の電磁装置。
【請求項８】　前記２次巻線の低電圧側近傍に前記１次巻線を配置したことを特徴とする請求項７記載の電磁装置。
【請求項９】　請求項２～８の何れかに記載された電磁装置からなるパルストランスと、パルストランスの１次巻線に並列接続されたコンデンサと、コンデンサから１次巻線への放電経路を開閉するスイッチ要素と、１次巻線に直列又は並列に接続される抵抗とを備えたことを特徴とする高電圧発生装置。
【請求項１０】　請求項２～８の何れかに記載された電磁装置からなるパルストランスと、パルストランスの１次巻線に並列接続されたコンデンサと、コンデンサから１次巻線への放電経路を開閉するスイッチ要素と、開磁路となる前記パルストランスの少なくとも一端側近傍に配設される金属板とを備えたことを特徴とする高電圧発生装置。
【請求項１１】　少なくとも前記パルストランス、コンデンサ、スイッチ要素を収容する装置本体を備え、この装置本体に放電ランプのランプ口金が電気的且つ機械的に接続されるソケット部を設け、このソケット部を介して前記パルストランスの２次巻線に発生する高電圧パルスをランプ口金に印加することを特徴とする請求項１０記載の高電圧発生装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電磁装置及び高電圧発生装置に関するものである。
【０００２】
【従来の技術】従来、ＨＩＤランプのような高圧放電ランプを始動するためにイグナイタと呼ばれる高電圧を発生する装置（高電圧発生装置）が必要であり、高電圧発生装置には低電圧の入力をパルス状の高電圧出力に変換するパルストランスのような電磁装置が用いられている。
【０００３】従来の電磁装置として図４６～図４９に示すような構造のものが提供されている。コイルボビン６０は合成樹脂のような絶縁性材料により略円筒形に形成され、両端に外鍔部６１が設けられるとともに両外鍔部６１の間に分離鍔部６２が設けられている。一方の外鍔部６１と分離鍔部６２との間には低電圧側である１次巻線６３が巻回され、他方の外鍔部６１と分離鍔部６２との間には高電圧側である２次巻線６４が巻回されている。なお、厚みの薄い箔状の平角導線を、その幅広の面が対向するように巻回（所謂エッジワイズ巻）することで２次巻線６４を構成し、沿面絶縁性の向上と巻線占有率の向上が図られている。そして、１次巻線６３及び２次巻線６４が巻回されたコイルボビン６０にＭｎ－Ｚｎフェライトからなるコ字状の磁気コア６５を挿着固定して電磁装置（パルストランス）が形成されている。
【０００４】
【発明が解決しようとする課題】ところで、近年自動車用の前照灯（ヘッドライト）において、安全性を重視する観点から従来のハロゲンランプよりも高輝度、低消費電力、長寿命であるＨＩＤランプような高圧放電ランプが使用されるようになっており、高圧放電ランプの急速な普及に伴ってイグナイタの寸法的な制約から極めて薄型の電磁装置が要望されている。しかしながら、上記従来装置では磁気コア６５とコイルとの間にコイルボビン６０が介在しているために薄型化が極めて困難であり、しかも、コイルボビン６０と磁気コア６５との間には挿着の隙間を要するために磁気コア６５とコイルとの間の距離が長くなって特性が低下し、ばらつきが大きいという欠点を有している。なお、コイルボビンの代わりに樹脂製の絶縁カバーを用いたものも提案されているが（特開２０００－３６４１６号公報参照）、やはり同様の欠点がある。
【０００５】本願発明は上記事情に鑑みて為されたものであり、その目的とするところは、薄型で優れた性能を有する電磁装置及び高電圧発生装置を提供することにある。
【０００６】
【課題を解決するための手段】請求項１の発明は、上記目的を達成するために、抵抗率が１０００Ω・ｍ以上の特性を有する磁気コアと、磁気コアの全周にわたって略

当接して巻設される巻線とを備え、平角導線を磁気コアに直接エッジワイズ巻することで前記巻線を巻設したことを特徴とし、磁気コアと巻線（平角導線）との間にコイルボビン等の絶縁物が不要となって巻線の外形を小さく且つ薄く形成することができ、薄型で優れた性能を有する電磁装置が提供できる。

【０００７】請求項２の発明は、請求項１の発明において、前記巻線の上に他の１乃至複数の巻線を巻設したことを特徴とし、薄型のトランスが実現できる。

【０００８】請求項３の発明は、請求項２の発明において、磁気コアに略当接して巻設された前記巻線と当該巻線の上に巻設された巻線の被覆同士を融着したことを特徴とし、複数の巻線の被覆同士を融着することで巻線間の位置決めが行え、巻線間の相対的な位置がずれることによる特性のばらつきなどが防止できる。

【０００９】請求項４の発明は、請求項１又は２又は３の発明において、磁気コアの表面を粗い仕上がりとしたことを特徴とし、磁気コアを形成した後の研磨等の後加工が不要となって磁気コアの製造コストを下げることができる。また、エッジワイズ巻の際に平角導線が滑って座屈するのを防止できる。

【００１０】請求項５の発明は、請求項２の発明において、複数のリード間に平角導線がエッジワイズ巻された磁気コアを配置し、前記リード同士を接合したことを特徴とし、請求項２の発明と同様の作用を奏する。

【００１１】請求項６の発明は、請求項２の発明において、筒形に形成され平角導線を巻回した前記磁気コアが挿着される第１の絶縁部材と、第１の絶縁部材の外周面に形成される溝に導電性樹脂を埋めて形成される巻線と、第１の絶縁部材の外周を覆う第２の絶縁部材とを備えたことを特徴とし、第１の絶縁部材によって平角導線からなる巻線と導電性樹脂からなる巻線との間の絶縁が可能になり、また、導電性樹脂によって第１の絶縁部材の外周面に巻線を形成した後に全体を絶縁性を有する第２の絶縁部材で覆っているため、平角導線からなる巻線の高電圧側の端末と導電性樹脂からなる巻線との間の絶縁を確保することができる。

【００１２】請求項７の発明は、請求項６の発明において、平角導線からなる前記巻線を２次巻線とし、前記第１の絶縁部材の外周面に形成される巻線を１次巻線としたことを特徴とし、請求項６の発明と同様の作用を奏する。

【００１３】請求項８の発明は、請求項７の発明において、前記２次巻線の低電圧側近傍に前記１次巻線を配置したことを特徴とし、２次巻線の高電圧側と１次巻線との間の沿面距離を十分に確保することができて絶縁性の向上が図れる。

【００１４】請求項９の発明は、上記目的を達成するために、請求項２～８の何れかに記載された電磁装置からなるパルストランスと、パルストランスの１次巻線に並列接続されたコンデンサと、コンデンサから１次巻線への放電経路を開閉するスイッチ要素と、１次巻線に直列又は並列に接続される抵抗とを備えたことを特徴とし、磁気コアと巻線（平角導線）との間にコイルボビン等の絶縁物が不要となって巻線の外形を小さく且つ薄く形成することができ、薄型で優れた性能を有する高電圧発生装置が提供できる。また、１次巻線に並列接続した抵抗の損失によって電圧の振動を抑制し、パルストランスの２次巻線から出力される高電圧パルスの波形を基本波に近い波形とすることができ、しかも、電圧の振動が速やかに収束できるためにコンデンサ等の回路部品にかかるストレスが緩和され、回路部品に耐圧の低い小型で安価なものを用いることができる。

【００１５】請求項１０の発明は、上記目的を達成するために、請求項２～８の何れかに記載された電磁装置からなるパルストランスと、パルストランスの１次巻線に並列接続されたコンデンサと、コンデンサから１次巻線への放電経路を開閉するスイッチ要素と、開磁路となる前記パルストランスの少なくとも一端側近傍に配設される金属板とを備えたことを特徴とし、磁気コアと巻線（平角導線）との間にコイルボビン等の絶縁物が不要となって巻線の外形を小さく且つ薄く形成することができ、薄型で優れた性能を有する高電圧発生装置が提供できる。また、金属板に生じる渦電流損によって電圧の振動を抑制し、パルストランスの２次巻線から出力される高電圧パルスの波形を基本波に近い波形とすることができ、しかも、電圧の振動が速やかに収束できるためにコンデンサ等の回路部品にかかるストレスが緩和され、回路部品に耐圧の低い小型で安価なものを用いることができる。

【００１６】請求項１１の発明は、請求項１０の発明において、少なくとも前記パルストランス、コンデンサ、スイッチ要素を収容する装置本体を備え、この装置本体に放電ランプのランプ口金が電気的且つ機械的に接続されるソケット部を設け、このソケット部を介して前記パルストランスの２次巻線に発生する高電圧パルスをランプ口金に印加することを特徴とし、放電ランプのランプ口金が接続されるソケットを一体に備えた薄型の高電圧発生装置が提供できる。

【００１７】

【発明の実施の形態】（実施形態１）本実施形態の電磁装置は単一巻線のインダクタであり、図１及び図２に示すように略円柱状に形成されたロッド形の磁気コア１に、コイルボビンなどの絶縁物を介さずに巻線を直接巻回して形成される。

【００１８】磁気コア１は抵抗率（固有抵抗）が大きいＮｉ－Ｚｎフェライト材（例えば、ＴＤＫ株式会社製のＬ１１Ｈ材）を用いて、直径約８ｍｍの円柱状に形成される。また、巻線は平角導線（例えば、第一電工株式会社製の平角リボンＥＤＷ線（厚み７０μｍ、幅１．４ｍ

ｍ））２を磁気コア１のほぼ全長にわたって一層にエッジワイズ巻することで形成される。具体的には、磁気コア１の軸方向両端面近傍を冶具で固定し、冶具を回転することで磁気コア１を回転させると同時に平角導線２を磁気コア１に巻き込むという新規の工法により行っている。

【００１９】上述のようにして形成された本実施形態について、磁気コア１に巻回した後の平角導線２の絶縁被覆を調べたところ、磁気コア１と巻線（平角導線２）との間の絶縁及び巻線間の絶縁は十分に確保されていることが判った。なお、磁気コア１と巻線間の絶縁については、磁気コア１の絶縁性の指標である抵抗率との関係があると推測されたが、抵抗率が１０００Ω・ｍ以上であれば絶縁特性に特に異常がないことが判った。また、磁気特性及び電気特性に関しても劣化がないことが判った。

【００２０】上述のように抵抗率の大きい材料で形成された磁気コア１に平角導線２を直接エッジワイズ巻して電磁装置を形成することにより、磁気コア１と巻線（平角導線２）との間にコイルボビン６０等の絶縁物が不要となって、巻線の外形を小さく且つ薄く形成して電磁装置の薄型化が図れる。また、磁気コア１に平角導線２を直接巻回しているため、巻線の全長が短くなって巻線抵抗を小さくすることができる。さらに、磁気コア１と巻線との間に空隙が生じないから、例えば同寸法及び同巻数で比較したときに自己インダクタンスを小さくすることができる。しかも、平角導線をコイルボビン等の絶縁物にエッジワイズ巻した従来構成では磁気コアと巻線との間に生じる空隙によって磁気コアと巻線との相対的な位置関係が不安定となり、インダクタンス値等の特性値がばらつく原因となっていたが、磁気コア１に平角導線２を直接巻回することで巻線が磁気コア１に強固に密着保持されるため、両者の相対的な位置が固定されて特性のばらつきも極めて小さくすることができる。

【００２１】（実施形態２）本実施形態は、図３に示すように磁気コア１を断面形状が楕円形の棒状に形成されている点に特徴があり、その他の構成については実施形態１と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００２２】磁気コア１は、実施形態１と同様にＮｉ－Ｚｎフェライト材を用いて断面形状が楕円形の棒状に形成され、平角導線２が直接エッジワイズ巻される。このように磁気コア１を断面形状が楕円形の棒状に形成したことによって、実施形態１に比較して低背化が図れるという利点がある。

【００２３】ところで、磁気コア１の両端面の中心には直径約２ｍｍの半球状の凹部３が凹設されており、図４に示すように平角導線２を巻回する際に回転用の冶具４が有する突起４ａを凹部３に嵌合することで冶具４と磁気コア１とを固定するようにしている。これにより、磁気コア１の回転軸が一定となり、磁気コア１の寸法ばらつきなどによって生じる回転の乱れを極力抑えることができ、平角導線２を均一に巻回することができる。

【００２４】（実施形態３）本実施形態は、図５に示すように磁気コア１の中心軸上に貫通孔５が設けられている点に特徴があり、その他の構成は実施形態２と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００２５】磁気コア１は実施形態２と同様に断面形状が楕円形の棒状に形成され、両端面の中心を結ぶ中心軸上に直径約２ｍｍの貫通孔５が設けてある。而して、実施形態２と同様に平角導線２を巻回する際に冶具４の突起４ａを貫通孔５に嵌合することで冶具４と磁気コア１とを固定することができる。さらに、図６に示すように器具などの筐体７に突設された棒状の突起物６を貫通孔５に挿通することによって磁気コア１を筐体７に強固に固定することができる。なお、突起物６として固定用のねじを用いても良い。また、磁気コア１を実施形態１と同様に円柱状に形成しても良い。

【００２６】（実施形態４）本実施形態は、図７～図９に示すように磁気コア１の両端部に略全周にわたって外側へ突出する外鍔部８が設けられている点に特徴があり、その他の構成は実施形態２と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００２７】磁気コア１は実施形態２と同様に断面形状が楕円形の棒状に形成され、長手方向両端部には略全周にわたって長手方向と略直交する方向（外側）へ突出する外鍔部８が設けられている。すなわち、エッジワイズ巻された平角導線２の両端部は不安定で解けてしまう虞があるが、外鍔部８を設けることで端部の平角導線２が外鍔部８と干渉し平角導線２が解けるのを防ぐことができる。

【００２８】また、磁気コア１の両端面に半球状の複数（本実施形態では２個）の凹部３が凹設されており、平角導線２を巻回する際に回転用の冶具４が有する複数の突起４ａを各凹部３に嵌合することで冶具４と磁気コア１とをより強固に固定するようにしている。これにより、実施形態２に比較して平角導線２をさらに安定して巻回することができる。なお、磁気コア１を実施形態１と同様に円柱状に形成しても良い。

【００２９】（実施形態５）本実施形態は磁気コア１の形状に特徴があり、その他の構成については実施形態１と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００３０】本実施形態の磁気コア１は、図１０に示すように、その断面の直径が長手方向の両端部から中央に向かって徐々に小さくなる形状に形成され、図１１に示すように平角導線２が直接エッジワイズ巻される。磁気コア１を上述のような形状に形成したことにより、平角導線２が巻回される磁気コア１の周面が両端部から中央

に向けて傾斜する傾斜面となり、平角導線２の両端部が磁気コア１の長手方向に沿って外側へ広がることがなく、安定に固定することができる。なお、磁気コア１を実施形態２と同様に断面形状が楕円形の棒状に形成しても良い。

【００３１】（実施形態６）本実施形態の電磁装置は２巻線のトランスであり、図１２に示すように略円柱状に形成されたロッド形の磁気コア１に、コイルボビンなどの絶縁物を介さずに１次巻線及び２次巻線を直接巻回して形成される。

【００３２】磁気コア１は実施形態１と同一構成のものであって、平角導線２が直接エッジワイズ巻されることで１次巻線９及び２次巻線１０が形成されている。このように磁気コア１に平角導線２を直接エッジワイズ巻することで１次巻線９及び２次巻線１０を形成しているため、コイルボビンに巻線を巻回する従来構成に比較して小型化が図れるとともに１次巻線９及び２次巻線１０の直流抵抗を減少させることができ、優れた性能を有するトランスが実現できる。また、１次巻線９と２次巻線１０を磁気コア１の長手方向において分離して形成しているため、両巻線間の絶縁を確保することができる。なお、磁気コア１を実施形態２と同様に断面形状が楕円形の棒状に形成しても良い。

【００３３】（実施形態７）本実施形態は磁気コア１の形状に特徴があり、その他の構成については実施形態６と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００３４】本実施形態の磁気コア１は、図１３に示すように長手方向両端部に略全周にわたって長手方向と略直交する方向（外側）へ突出する外鍔部８ａ，８ｂが設けられ、長手方向中央から一方の端部よりの位置に略全周にわたって長手方向と略直交する方向（外側）へ突出する分離鍔部１１が設けられている。

【００３５】一方の外鍔部８ａと分離鍔部１１との間に平角導線２が直接エッジワイズ巻されて１次巻線９が形成され、他方の外鍔部８ｂと分離鍔部１１との間に平角導線２が直接エッジワイズ巻されて２次巻線１０が形成される。

【００３６】而して、外鍔部８ａ，８ｂを設けることでエッジワイズ巻された平角導線２の端部が外鍔部８ａ，８ｂで規制されてばらけが防止されるとともに、１次巻線９と２次巻線１０との間に磁気コア１の一部である分離鍔部１１が介在することで両巻線９，１０間の絶縁を実施形態６に比較して確実に確保することができる。なお、磁気コア１を実施形態２と同様に断面形状が楕円形の棒状に形成しても良い。

【００３７】（実施形態８）本実施形態は磁気コア１の形状に特徴があり、その他の構成については実施形態７と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００３８】本実施形態の磁気コア１は、図１５に示すように、その断面の直径が長手方向の外鍔部８ａ，８ｂを除く各端部と略中央部との間で各端部から端部と中央部との中間部分に向かって徐々に小さくなる形状に形成され、図１６に示すように各端部と中央部との間に平角導線２が直接エッジワイズ巻されて１次巻線９及び２次巻線１０が形成されている。なお、磁気コア１の両端面の中心には実施形態２と同様の凹部３が凹設されている。

【００３９】而して、磁気コア１を上述のような形状に形成したことにより、１次巻線９及び２次巻線１０が形成される部位の磁気コア１の周面が両端部から中間部分に向けて傾斜する傾斜面となり、平角導線２の両端部が磁気コア１の長手方向に沿って外側へ広がることがなく、安定に固定することができる。しかも、１次巻線と９と２次巻線１０との間では磁気コア１の断面の直径が平角導線２を巻回した部位の断面の直径よりも大きくなっているから、両巻線９，１０間の絶縁を実施形態６に比較して確実に確保することができるという利点がある。なお、磁気コア１を実施形態２と同様に断面形状が楕円形の棒状に形成しても良い。

【００４０】（実施形態９）本実施形態の電磁装置は２巻線のトランスであり、図１７に示すように略円柱状に形成されたロッド形の磁気コア１に、コイルボビンなどの絶縁物を介さずに１次巻線及び２次巻線を直接巻回して形成される。

【００４１】磁気コア１は、図１９に示すようにＮｉ－Ｚｎフェライト材（例えば、トミタ電機株式会社製のＫ５材）を用いて、長方形と半円とを組み合わせた略楕円形の断面形状を有する棒状に形成される。本実施形態では、断面の半円部分の直径を約６ｍｍ、長方形部分の長さを約５ｍｍ、長手方向の長さを約３０ｍｍとしている。また、磁気コア１の両端面の中心には直径及び深さが約２ｍｍの凹部３が凹設してある。

【００４２】磁気コア１には、平角導線２（例えば、第一電工株式会社製の平角リボンＥＤＷ・Ｈ線（厚み０．０７０ｍｍ、幅１．４ｍｍ））を一層で直接、２２０ターン程度エッジワイズ巻することで２次巻線１０が形成されている。ここで、本実施形態における２次巻線１０の直流抵抗は１．８Ω程度であった。また、図１７及び図１８に示すように、２次巻線１０の低電圧側の端末１０ａ近傍から磁気コア１の長手方向中央にかけて２次巻線１０の上から電線（例えば、東京特殊電線株式会社製の三層絶縁電線ＴＩＷ－Ｅ線（導体径０．２ｍｍ、仕上がり外径０．５１ｍｍ））を６ターン程度巻回することで１次巻線９が形成されている（但し、図１７及び図１８においては３ターン程度巻回した場合を例示している）。

【００４３】本実施形態は上述のように構成されるものであるから、２次巻線１０の上に１次巻線９を巻回する

ことで両巻線９，１０間の磁気結合が強くなり、電力の伝達効率を向上することができる。その結果、実施形態７又は実施形態８のように磁気コイル１に両巻線９，１０を分割巻する構造に比較してパルストランスとして用いた場合に高い２次電圧を得ることができる。例えば、１次電圧を６００Ｖとした場合にはピーク値で３０ｋＶ程度のパルス出力を得ることが可能となった。また、２次巻線１０の低電圧側の端末１０ａ近傍に１次巻線９を形成することにより、２次巻線１０の高電圧側の端末１０ｂと１次巻線９との間の沿面距離を十分に確保することができ絶縁性の向上が図れる。しかも、被覆の厚い電線で１次巻線９を形成することにより、両巻線９，１０間の絶縁を十分に確保することができる。なお、図２０に示すように磁気コイル１の長手方向における２次巻線１０の低電圧側の端末１０ａに隣接して１次巻線９を形成するようにしても同様の効果を奏することが可能である。

【００４４】（実施形態１０）本実施形態の電磁装置は２巻線のトランスであり、図２１及び図２２に示すように略円柱状に形成されたロッド形の磁気コア１に、コイルボビンなどの絶縁物を介さずに平角導線２ａ，２ｂをエッジワイズ巻することで１次巻線９及び２次巻線１０が形成される。

【００４５】磁気コア１は実施形態１と同一構成のものであって、長手方向の略全体に平角導線２ｂが直接エッジワイズ巻されることで２次巻線１０が形成されている。さらに、磁気コア１の長手方向における２次巻線１０の低電圧側の端末１０ａ近傍に、２次巻線１０を形成する平角導線２ｂに数ターン重ねて平角導線２ａをエッジワイズ巻することで１次巻線９が形成されている。

【００４６】このように磁気コア１に平角導線２ａ，２ｂを直接エッジワイズ巻することで１次巻線９及び２次巻線１０を形成しているため、１次巻線９の外形寸法が２次巻線１０の外形寸法に略等しくなり、実施形態９に比較して電磁装置の小型化及び薄型化が可能となる。また、１次巻線９も２次巻線１０と同様に平角導線２ａを磁気コア１に直接エッジワイズ巻して形成しているため、両巻線９，１０を同一の工程で生産することができて生産性の向上が図れるという利点がある。

【００４７】（実施形態１１）本実施形態は１次巻線９の構造に特徴があり、その他の構成については実施形態９と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００４８】図２３及び図２４に示すように、本実施形態における１次巻線９は矩形状の導電箔１２と矩形シート状の絶縁フィルム１３とを、磁気コア１に平角導線２を直接エッジワイズ巻することで形成された１次巻線１０上に交互に巻回することで形成されている。なお、導電箔１２の一端縁の両端部には細い帯状の端末片１２ａが形成されており、これらの端末片１２ａを１次巻線９の端末としている。

【００４９】１次巻線９の製造工程をさらに詳しく説明する。図２５に示すように矩形シート状の絶縁フィルム１３の一端側に導電箔１２を載置し、他端側より磁気コア１に巻回された２次巻線１０上に巻き付ければ、最初に絶縁フィルム１３が２次巻線１０上に巻回された後、導電箔１２と絶縁フィルム１３が交互に巻回され、図２４に示すように２次巻線１０上に絶縁フィルム１３を介して導電箔１２が多層に巻回されることで１次巻線９が形成される。上記構成によれば、絶縁フィルム１３によって２次巻線１０と１次巻線９との間の絶縁と導電箔１２間の絶縁とを同時に確保することができる。なお、本実施形態においては２次巻線１０の低電圧側の端末１０ａ近傍から磁気コイル１の長手方向中央にかけて１次巻線９が形成してある。

【００５０】上述のように厚みの薄い導電箔１２と絶縁フィルム１３とで１次巻線９を形成しているため、電磁装置のより一層の薄型化が図れるとともに、１次巻線９と２次巻線１０との間の距離を短くして磁気結合を強化することができ、電力の伝達効率を向上することができて高い出力電圧が得られるという利点がある。しかも、１次巻線９の導体断面積を広く取ることができるから、直流抵抗を減少させて大きな１次電流が得られるという利点もある。

【００５１】（実施形態１２）本実施形態は１次巻線９の構造に特徴があり、その他の構成については実施形態９と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００５２】図２６及び図２７に示すように、本実施形態では平角導線２が直接エッジワイズ巻されて２次巻線１０が形成された磁気コア１を、絶縁物によって略筒状に形成された絶縁ケース１４の中に挿着し、この絶縁ケース１４の上に電線を巻回して１次巻線９が形成されている。絶縁ケース１４は磁気コア１の長手方向の全長よりも短くない寸法に形成され、内部に挿着された磁気コア１及び２次巻線１０の全体を覆っている。

【００５３】そして、２次巻線１０の低電圧側の端末１０ａ近傍から磁気コア１の長手方向中央にかけて絶縁ケース１４の上から電線（例えば、平角導線）を数ターン巻回することで１次巻線９が形成されている。

【００５４】而して、本実施形態では上述のように構成しているので、絶縁ケース１４によって１次巻線９と２次巻線１０との間の絶縁が確保できるとともに、絶縁ケース１４が２次巻線１０全体を覆っていることから２次巻線１０の高電圧側の端末１０ｂから１次巻線９に至る沿面を介した絶縁破壊も防止できる。

【００５５】（実施形態１３）本実施形態は１次巻線９の構造に特徴があり、その他の構成については実施形態９と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００５６】本実施形態は、図２８に示すように融着性を有する樹脂で被覆された電線を２次巻線１０の上に巻回し、２次巻線１０を形成する平角導線２の被覆と上記電線の被覆とを融着させることで１次巻線９の位置決めを行うようにした点に特徴がある。

【００５７】而して、両巻線９，１０の被覆同士を融着することで１次巻線９の位置決めが行えるため、１次巻線９の相対的な位置がずれることによる特性のばらつきなどが防止できる。なお、２次巻線１０を形成する平角導線２の被覆にも融着性を有する樹脂を用い、磁気コア１に直接エッジワイズ巻された平角導線２の被覆を磁気コア１に融着して２次巻線１０の位置決めを行うようにしても良い。

【００５８】（実施形態１４）本実施形態は１次巻線９の構造に特徴があり、その他の構成については実施形態９と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００５９】図２９に示すように、合成樹脂製のケース１５の収容部１５ａに薄い金属板等からなるリード１６がインサート成形されており、平角導線２が直接エッジワイズ巻されて２次巻線１０が形成された磁気コア１を上記収容部１５ａに収容し、磁気コア１を挟んで対向するリード１６の先端間に薄い金属板等からなるリード片１７を橋架し、リード片１７の両端部と各リード１６の先端部を接合する。この結果、リード１６及びリード片１７が２次巻線１０の周囲に巻回されることとなり、リード１６及びリード片１７によって１次巻線９が形成されることになる。

【００６０】上述のように構成すれば、電磁装置（トランス）の小型化及び低背化を図ることができる。

【００６１】（実施形態１５）ところで、実施形態９においては２次巻線１０の高電圧側の端末１０ｂから沿面を介して１次巻線９との間で絶縁破壊の虞があるため、１次巻線９には導体径のおよそ５倍の外径を有する電線を用いている。しかしながら、このように太い電線を用いると電磁装置（トランス）の外径が大型化し、用途によっては十分な薄型化が図れない場合もある。また、電線として断面円形の絶縁線を用いているため、２次巻線１０上に巻回する際に位置の確定が容易でなく巻太り等が生じる虞もある。また、実施形態１２においては１次巻線９の線径は小さくなるものの、絶縁ケース１４の分だけ電磁装置（トランス）の外形寸法が大きくなり、部品点数が増加したり組立が困難になるといった不利な点がある。

【００６２】そこで本実施形態は、図３０及び図３１に示すように１次巻線９と絶縁物を含む１次巻線部品１８に、平角導線２が直接エッジワイズ巻されて２次巻線１０が形成された磁気コア１を挿着することで電磁装置（トランス）を構成している。このように本実施形態は１次巻線９の構造に特徴があり、その他の構成については実施形態９と共通であるため、共通する構成には同一の符号を付して説明を省略する。

【００６３】１次巻線部品１８は、図３２に示すように絶縁性を有する合成樹脂により断面形状が磁気コア１と同じ略楕円形の筒状に形成された筒体（第１の絶縁部材）１９を有している。この筒体１９は、例えば、ポリエーテルイミド（ＧＥ社製、商品名「ウルテム」）のような熱可塑性樹脂によって形成され、外周面には１次巻線を形成するための溝１９ａが全周にわたって数ターン程度形成されている。さらに１次巻線の端末を形成するための溝１９ｂを有する突片１９ｃが長手方向に沿って突設されている。

【００６４】而して、図３３に示すように金型２０にセットされた上記筒体１９の溝１９ａに導電性樹脂２１を流し込めば、流動性に優れた導電性樹脂２１が溝１９ａ，１９ｂ全体に行き渡り、導電性樹脂２１を十分に硬化させることで筒体１９の外周面を溝１９ａ，１９ｂに沿って巻回する１次巻線９が形成される。

【００６５】上述のようにして１次巻線９が形成された筒体１９を、長手方向両端の開口を露出するようにして筒体１９全体を合成樹脂（例えば、筒体１９を形成するポリエーテルイミド）で覆うことにより、図３４に示すように筒体１９を絶縁性を有する合成樹脂の成形部（第２の絶縁部材）２２で覆った１次巻線部品１８が形成される。

【００６６】そして、１次巻線部品１８の筒体１９内に２次巻線１０が形成された磁気コア１を挿着し、１次巻線９の端末に端子片２３を取り付けることによって電磁装置（トランス）が構成される（図３０及び図３１参照）。なお、１次巻線部品１８は２次巻線１０の低電圧側の端末１０ａ近傍から磁気コア１の長手方向中央にかけて挿着されている。

【００６７】本実施形態は上述のように構成したものであるから、１次巻線部品１８によって１次巻線９と２次巻線１０との間の絶縁が可能になる。また、導電性樹脂２１によって筒体１９の外周面に１次巻線９を形成した後に筒体１９全体を絶縁性を有する合成樹脂製の成形部２２で覆っているため、２次巻線１０の高電圧側の端末と１次巻線９との間の絶縁を確保することができる。しかも、流動性に優れた導電性樹脂１２を筒体１９の溝１９ａ，１９ｂに流し込むことで１次巻線９が形成されるため、電線を巻回して１次巻線を形成する場合に比較して電線の巻回工程が不要となって組立が容易になって量産性が向上するとともに電線の被覆の寸法ばらつきや巻回時の巻乱れ等の冗長さがなくなり、小型で薄い１次巻線９を形成することができ、さらには電磁装置全体の小型化及び薄型化が図れる。

【００６８】ところで、本実施形態並びに上述した実施形態１～１４においては、フェライト材を棒状に成形して磁気コア１を形成した後に磁気コア１の表面に研磨等

の加工を施しているが、このような後加工を施さずに磁気コア１の表面を粗い仕上がりとしても良い。この場合、磁気コア１の表面粗さを算術平均粗さ（Ｒａ）が０．８μｍ程度より粗くなるように磁気コア１を形成することが望ましい。これにより、磁気コア１を形成した後の研磨等の後加工が不要となって磁気コア１の製造コストを下げることができる。しかも、上記後加工を行って磁気コア１の表面粗さを低下させた場合には、図３５に示すようにエッジワイズ巻の際に平角導線２が滑って座屈してしまう虞があるが、上述のように磁気コア１の表面を粗い仕上がりとすることによって平角導線２の座屈が防止できる。

【００６９】（実施形態１６）図３８は従来の高電圧発生装置の一例を示す概略回路構成図である。この従来装置は高圧放電ランプＬｐに高電圧パルスを印加して始動するイグナイタであって、電圧が印加される入力端子Ｔ１，Ｔ２と、高圧放電ランプＬｐの両端に接続される出力端子Ｔ３，Ｔ４と、高電圧側の入力端子Ｔ１及び高電圧側の出力端子Ｔ３間に２次巻線が接続され、入力端子Ｔ１，Ｔ２間に１次巻線が接続されたパルストランスＰＴと、パルストランスＰＴの１次巻線の低電圧側と低電圧側の入力端子Ｔ２との間に挿入されたスイッチ要素ＳＷと、高電圧側の入力端子Ｔ１とパルストランスＰＴの１次巻線の高電圧側との間に挿入された抵抗Ｒ１と、パルストランスＰＴの１次巻線及びスイッチ要素ＳＷに並列に接続されたコンデンサＣ１とを備えている。この従来装置の動作を説明すると、高圧放電ランプＬｐが点灯していない状態で入力端子Ｔ１，Ｔ２間に電圧が印加されると抵抗Ｒ１を介してコンデンサＣ１が充電され、コンデンサＣ１の両端電圧が上昇して所定値に達したときにスイッチ要素ＳＷをオンすることでパルストランスＰＴの１次巻線にスイッチ要素ＳＷを介してコンデンサＣ１の充電電荷が放電され、パルストランスＰＴの２次巻線にパルス状の高電圧が発生する。この高電圧パルスが高圧放電ランプＬｐの両端に印加されて高圧放電ランプＬｐを絶縁破壊に至らしめて始動するものである。

【００７０】図３９は上記従来装置における高電圧パルスの出力波形の一例を示しており、パルストランスＰＴの１次巻線とコンデンサＣ１の共振電圧をパルストランスＰＴで昇圧した波形に高周波成分が重畳した波形となっている。これは、パルストランスＰＴが理想的なトランスではなく、実際には寄生容量等が存在することに起因している。しかしながら、高圧放電ランプＬｐを速やかに絶縁破壊に至らしめて始動するためには、上記高周波成分が抑制された基本波に近い波形である方がよい。また、高電圧発生装置としては電圧の振動が速やかに収束する方がコンデンサＣ１等の回路部品にかかるストレスが緩和されるため、回路部品に耐圧の低い小型で安価なものを用いることができる。

【００７１】そこで本実施形態の高電圧発生装置では、図３６に示すようにパルストランスＰＴの磁気コア１の両端近傍に金属板２４を配設することで上記高周波振動を抑制している。つまり、磁気コア１の両端部は開磁路となっており、上記高周波振動に起因して磁気コア１の両端部から漏れて金属板２４を通過する磁束が変化し、金属板２４に渦電流が流れて渦電流損が生じることで上記高周波振動が抑制されるのである。なお、本実施形態におけるパルストランスＰＴには実施形態６～１５の何れかの構成を有する電磁装置（トランス）を用いる。

【００７２】本実施形態によれば、金属板２４に生じる渦電流損によって上記高周波成分を抑制し、高圧放電ランプＬｐに印加される高電圧パルスの波形を図３７に示すような基本波に近い波形とすることができ、しかも、電圧の振動が速やかに収束できるためにコンデンサＣ１等の回路部品にかかるストレスが緩和され、回路部品に耐圧の低い小型で安価なものを用いることができるという利点がある。なお、回路部品を電気的に接続するためのリードをパルストランスＰＴの磁気コア１の両端近傍に配置して金属板２４の代わりに用いれば、部品点数の削減と構成の簡略化が図れるという利点がある。

【００７３】（実施形態１７）本実施形態の高電圧発生装置は、図４０に示すようにパルストランスＰＴの１次巻線と並列に抵抗Ｒａを接続した点に特徴があり、これ以外の構成は図３８に示した従来装置と共通である。よって、共通する構成には同一の符号を付して説明を省略する。

【００７４】而して、１次巻線に並列接続した抵抗Ｒａでの損失によって上記高周波振動を抑制することができるものである。なお、図４１に示すようにパルストランスＰＴの１次巻線と直列に抵抗Ｒｂを接続しても同様の効果が得られる。

【００７５】（実施形態１８）本実施形態の高電圧発生装置は、図４２に示すように高圧放電ランプＬｐが着脱自在に装着されるソケットと一体に構成されている点に特徴がある。

【００７６】本実施形態の高電圧発生装置は、図４３に示すように合成樹脂製の装置本体３０と、装置本体３０の前面を除く背面及び周面を覆うシールドカバー５０とを備えている。装置本体３０は実施形態１６で説明したパルストランスＰＴを含む回路部品が収容されるボディ３１と、ボディ３１の前面を覆うカバー３２と、ボディ３１の背面を閉塞する蓋体３３とを組み立てて構成される。

【００７７】カバー３２の前面には略円形のソケット開口部３４が開口し、このソケット開口部３４の周縁部分にバヨネット式の係止部３５が周方向に複数設けてある。係止部３５はソケット開口部３４の周縁部分に一体に設けられ、中心に向いた切欠からなり、高圧放電ランプＬｐのランプ口金の外周面に設けられた係合部（図示せず）をソケット開口部３４の前方から背方へに挿入さ

せる縦溝３５ａと、この縦溝３５ａに連続する横溝３５ｂとからなるＬ字形溝を有し、さらに係合部を係止位置で抜け止めする係止凹部３５ｃが内面に形成されている。

【００７８】ボディ３１はカバー３２のソケット開口部３４の内側に配置される略円筒形の筒部３６と、カバー３２の周面に設けられた係合孔３７と凹凸係合する係合爪３８とを有し、ボディ３１の前面にカバー３２を被せて係合爪３８を係合孔３７に係合することによってソケット開口部３４の内側に筒部３６が配置された状態でボディ３１とカバー３２が組み立てられる（図４２参照）。また、ボディ３１の筒部３６の中心には略円筒形の中央筒部３９が突設されており、この中央筒部３９の内側にランプ口金の中央電極部（図示せず）と接触導通する中央電極４０が収納されている。さらに、ランプ口金の外周面に設けられた外側電極部（図示せず）と接触導通する複数の外側電極４１が筒部３６に取り付けられており、ボディ３１とカバー３２を組み立てたときに筒部３６の前面側に露出する外側電極４１の接触部４１ａがソケット開口部３４の内側に臨むようにしてある。すなわち、ランプ口金をソケット開口部３４に挿入するとき係合部が係止部３５の縦溝３５ａに挿入され、ランプ口金を回転すると係合部が横溝３５ｂに進入して係止凹部３５ｃに係止し抜け止めされ、ランプ口金の中央電極部が中央筒部３９内に挿入されて中央電極４０と接触導通し、同時にソケット開口部３４の内側に臨む外側電極４１の接触部４１ａがランプ口金の外側電極部に接触導通することにより、本実施形態の高電圧発生装置と高圧放電ランプＬｐが電気的且つ機械的に接続される。

【００７９】一方、ボディ３１の前面側には抵抗Ｒ１やコンデンサＣ１などの回路部品が収容される第１の収容凹部４２が設けられる。また、図４４に示すようにボディ３１の背面側にはパルストランスＰＴを収容する収容凹所４３が設けてある。このパルストランスＰＴは実施形態９の電磁装置（トランス）と同じ構成を有し、図４５に示すように断面が略楕円形状のロッド形の磁気コア１に平角導線２を直接エッジワイズ巻して２次巻線１０が形成されるとともに２次巻線１０の上から電線を６ターン程度巻回することで１次巻線９が形成されたものである。

【００８０】蓋体３３はボディ３１の周面に設けられた複数の係合突部４４と各々凹凸係合する複数の係合溝４５が周壁３３ａに設けられ、ボディ３１の背面に蓋体３３を被せて係合突部４４を係合溝４５に係合することによってボディ３１に蓋体３３が取り付けられてボディ３１の背面が蓋体３３によって閉塞される。

【００８１】シールドカバー５０は導電性を有する磁性体材料によって一面が開口する箱形に形成され、カバー３２の周面に突設された嵌合突起４６と凹凸嵌合する嵌合孔４７が周壁に設けられている。而して、ボディ３１とカバー３２と蓋体３３を組み立ててなる装置本体３０を背面側からシールドカバー５０内に挿入し、カバー３２の嵌合突起４６を嵌合孔４７に嵌合することでシールドカバー５０が装置本体３０に取り付けられる。

【００８２】ここで、装置本体３０内に収容されたパルストランスＰＴの磁気コア１の両端部がシールドカバー５０の周壁と対向するようにボディ３１内に配置されているため、装置本体３０にシールドカバー５０を取り付けた状態では磁気コア１とシールドカバー５０とで閉磁路が形成される。このように装置本体３０をシールドカバー５０で覆うとともに、パルストランスＰＴの磁気コア１とシールドカバー５０とで閉磁路を形成することにより、高電圧発生装置から放射されるノイズが抑制できるとともに、パルストランスＰＴの出力（高電圧パルス）を大きくすることができ、しかも、装置全体の小型化並びに薄型化も図れる。なお、本実施形態におけるシールドカバー５０は実施形態１６における金属板２４の役割も果たしており、金属板２４が不要となって部品点数の削減と構成の簡略化が図れるという利点がある。

【００８３】

【発明の効果】請求項１の発明は、抵抗率が１０００Ω・ｍ以上の特性を有する磁気コアと、磁気コアの全周にわたって略当接して巻設される巻線とを備え、平角導線を磁気コアに直接エッジワイズ巻することで前記巻線を巻設したので、磁気コアと巻線（平角導線）との間にコイルボビン等の絶縁物が不要となって巻線の外形を小さく且つ薄く形成することができ、薄型で優れた性能を有する電磁装置が提供できるという効果がある。

【００８４】請求項２の発明は、請求項１の発明において、前記巻線の上に他の１乃至複数の巻線を巻設したので、薄型のトランスが実現できるという効果がある。

【００８５】請求項３の発明は、請求項２の発明において、磁気コアに略当接して巻設された前記巻線と当該巻線の上に巻設された巻線の被覆同士を融着したので、複数の巻線の被覆同士を融着することで巻線間の位置決めが行え、巻線間の相対的な位置がずれることによる特性のばらつきなどが防止できるという効果がある。

【００８６】請求項４の発明は、請求項１又は２又は３の発明において、磁気コアの表面を粗い仕上がりとしたので、磁気コアを形成した後の研磨等の後加工が不要となって磁気コアの製造コストを下げることができ、また、エッジワイズ巻の際に平角導線が滑って座屈するのを防止できるという効果がある。

【００８７】請求項５の発明は、請求項２の発明において、複数のリード間に平角導線がエッジワイズ巻された磁気コアを配置し、前記リード同士を接合したので、請求項２の発明と同様の効果を奏する。

【００８８】請求項６の発明は、請求項２の発明において、筒形に形成され平角導線を巻回した前記磁気コアが挿着される第１の絶縁部材と、第１の絶縁部材の外周面

に形成される溝に導電性樹脂を埋めて形成される巻線と、第１の絶縁部材の外周を覆う第２の絶縁部材とを備えたので、第１の絶縁部材によって平角導線からなる巻線と導電性樹脂からなる巻線との間の絶縁が可能になり、また、導電性樹脂によって第１の絶縁部材の外周面に巻線を形成した後に全体を絶縁性を有する第２の絶縁部材で覆っているため、平角導線からなる巻線の高電圧側の端末と導電性樹脂からなる巻線との間の絶縁を確保することができるという効果がある。

【００８９】請求項７の発明は、請求項６の発明において、平角導線からなる前記巻線を２次巻線とし、前記第１の絶縁部材の外周面に形成される巻線を１次巻線としたので、請求項６の発明と同様の効果を奏する。

【００９０】請求項８の発明は、請求項７の発明において、前記２次巻線の低電圧側近傍に前記１次巻線を配置したので、２次巻線の高電圧側と１次巻線との間の沿面距離を十分に確保することができて絶縁性の向上が図れるという効果がある。

【００９１】請求項９の発明は、請求項２～８の何れかに記載された電磁装置からなるパルストランスと、パルストランスの１次巻線に並列接続されたコンデンサと、コンデンサから１次巻線への放電経路を開閉するスイッチ要素と、１次巻線に直列又は並列に接続される抵抗とを備えたので、磁気コアと巻線（平角導線）との間にコイルボビン等の絶縁物が不要となって巻線の外形を小さく且つ薄く形成することができ、薄型で優れた性能を有する高電圧発生装置が提供できるという効果がある。また、１次巻線に並列接続した抵抗の損失によって電圧の振動を抑制し、パルストランスの２次巻線から出力される高電圧パルスの波形を基本波に近い波形とすることができ、しかも、電圧の振動が速やかに収束できるためにコンデンサ等の回路部品にかかるストレスが緩和され、回路部品に耐圧の低い小型で安価なものを用いることができるという効果がある。

【００９２】請求項１０の発明は、請求項２～８の何れかに記載された電磁装置からなるパルストランスと、パルストランスの１次巻線に並列接続されたコンデンサと、コンデンサから１次巻線への放電経路を開閉するスイッチ要素と、開磁路となる前記パルストランスの少なくとも一端側近傍に配設される金属板とを備えたので、磁気コアと巻線（平角導線）との間にコイルボビン等の絶縁物が不要となって巻線の外形を小さく且つ薄く形成することができ、薄型で優れた性能を有する高電圧発生装置が提供できるという効果がある。また、金属板に生じる渦電流損によって電圧の振動を抑制し、パルストランスの２次巻線から出力される高電圧パルスの波形を基本波に近い波形とすることができ、しかも、電圧の振動が速やかに収束できるためにコンデンサ等の回路部品にかかるストレスが緩和され、回路部品に耐圧の低い小型で安価なものを用いることができるという効果がある。

【００９３】請求項１１の発明は、請求項１０の発明において、少なくとも前記パルストランス、コンデンサ、スイッチ要素を収容する装置本体を備え、この装置本体に放電ランプのランプ口金が電気的且つ機械的に接続されるソケット部を設け、このソケット部を介して前記パルストランスの２次巻線に発生する高電圧パルスをランプ口金に印加するので、放電ランプのランプ口金が接続されるソケットを一体に備えた薄型の高電圧発生装置が提供できるという効果がある。

【図面の簡単な説明】

【図１】実施形態１を示す斜視図である。

【図２】同上の断面図である。

【図３】実施形態２を示す斜視図である。

【図４】同上の製造工程を説明する説明図である。

【図５】実施形態３を示す斜視図である。

【図６】同上の使用状態を示す断面図である。

【図７】実施形態４における磁気コアの断面図である。

【図８】同上の磁気コアに平角導線を巻回する途中の状態を示す斜視図である。

【図９】同上の斜視図である。

【図１０】実施形態５を示す斜視図である。

【図１１】同上の断面図である。

【図１２】実施形態６を示す斜視図である。

【図１３】実施形態７における磁気コアの断面図である。

【図１４】同上の斜視図である。

【図１５】実施形態８を示す斜視図である。

【図１６】同上の断面図である。

【図１７】実施形態９を示す斜視図である。

【図１８】同上の断面図である。

【図１９】同上における磁気コアを示し、（ａ）は正面図、（ｂ）は側面図である。

【図２０】同上の他の構成を示す断面図である。

【図２１】実施形態１０を示す斜視図である。

【図２２】同上の断面図である。

【図２３】実施形態１１を示す斜視図である。

【図２４】同上の断面図である。

【図２５】同上の製造工程を説明する説明図である。

【図２６】実施形態１２を示す斜視図である。

【図２７】同上の断面図である。

【図２８】実施形態１３を示す斜視図である。

【図２９】実施形態１４を示す一部省略した斜視図である。

【図３０】実施形態１５を示す斜視図である。

【図３１】同上の断面図である。

【図３２】同上における筒体の斜視図である。

【図３３】同上の製造工程を説明する説明図である。

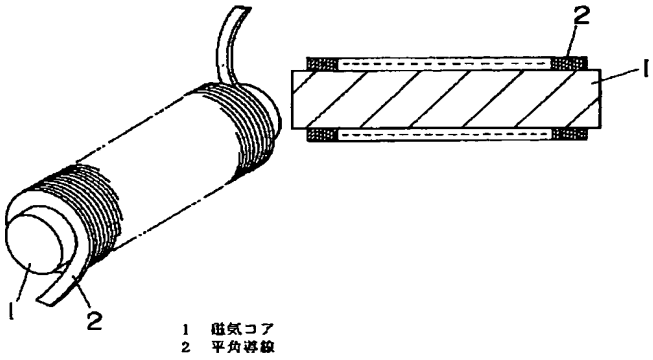
【図３４】同上における１次巻線部品の斜視図である。

【図３５】同上の説明図である。

【図３６】実施形態１６を示す平面図である。

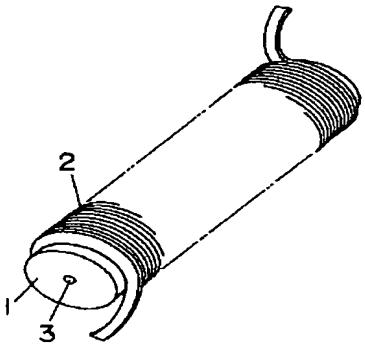
【図３７】同上の動作説明用の波形図である。
【図３８】従来の高電圧発生装置を示す概略回路構成図である。
【図３９】従来装置の動作説明用の波形図である。
【図４０】実施形態１７を示す概略回路構成図である。
【図４１】同上の他の構成を示す概略回路構成図である。
【図４２】実施形態１８を示す斜視図である。
【図４３】同上の分解斜視図である。
【図４４】同上におけるボディを背面側から見た斜視図である。
【図４５】同上におけるパルストランスの側面図である。
【図４６】従来例を示す分解斜視図である。
【図４７】同上の斜視図である。
【図４８】同上の断面図である。
【図４９】同上におけるコイルボビンの斜視図である。
【符号の説明】
1　磁気コア
2　平角導線

【図１】

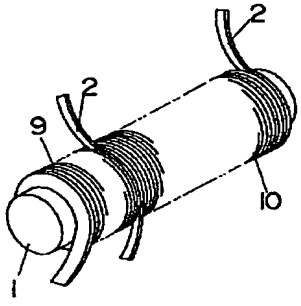


【図２】

【図３】



【図１２】



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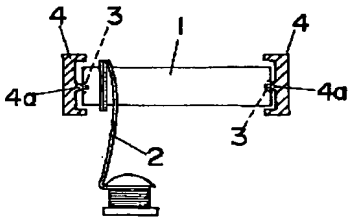

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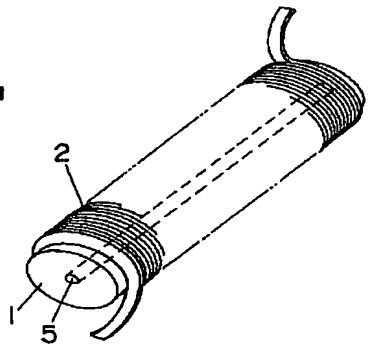

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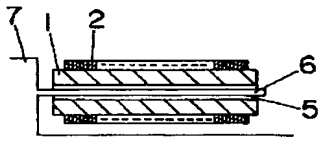

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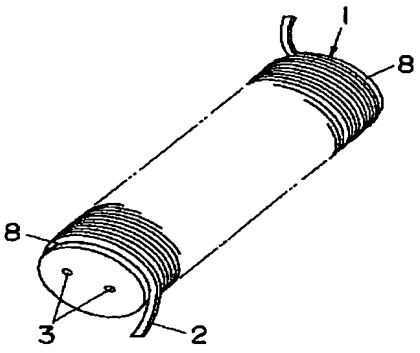

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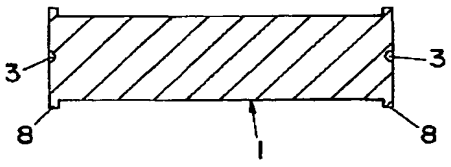

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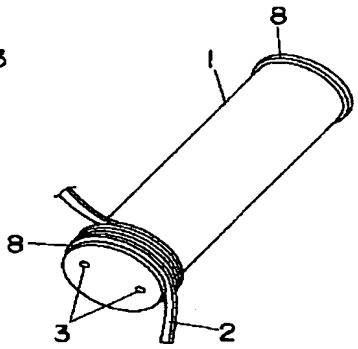

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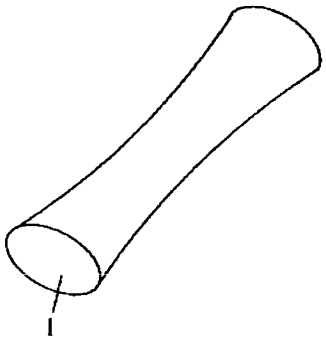

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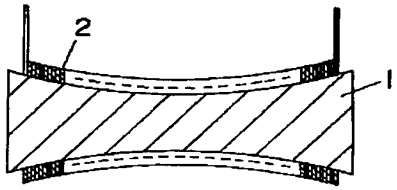

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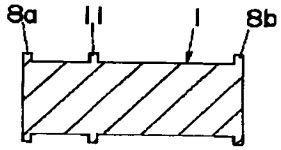
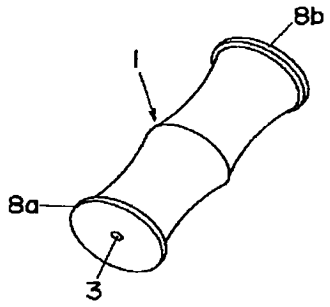


【図15】



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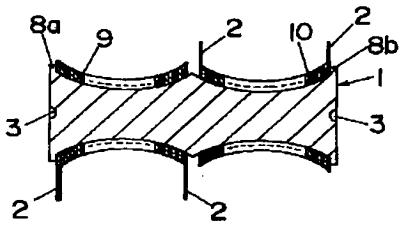

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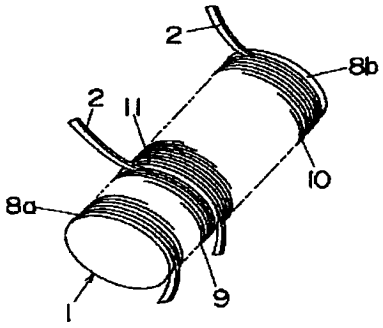

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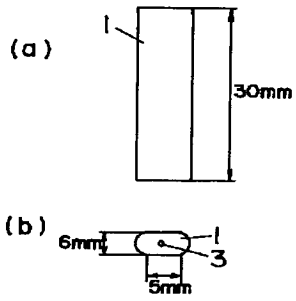

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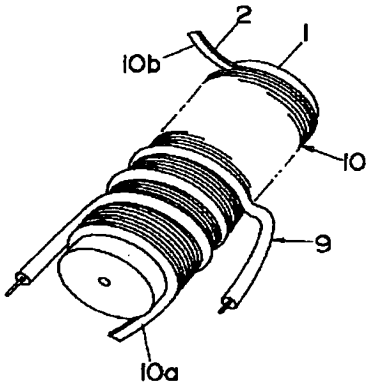
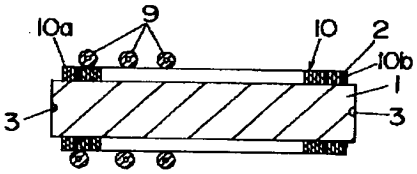
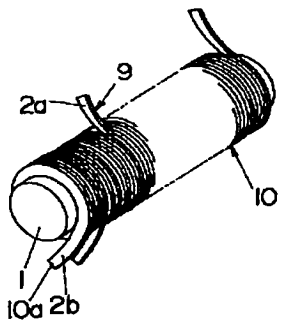


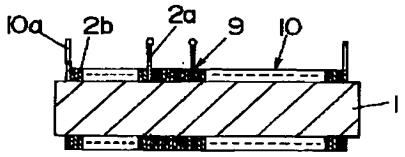
【図18】



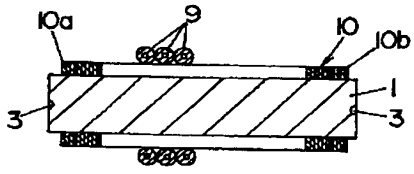
【図21】



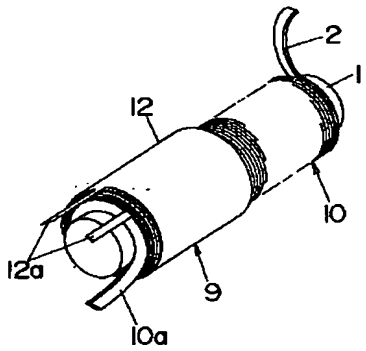
【図22】



【図20】



【図23】



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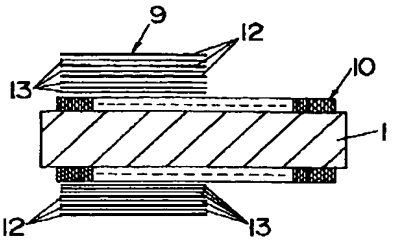
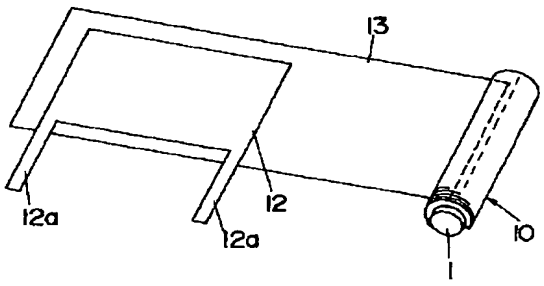
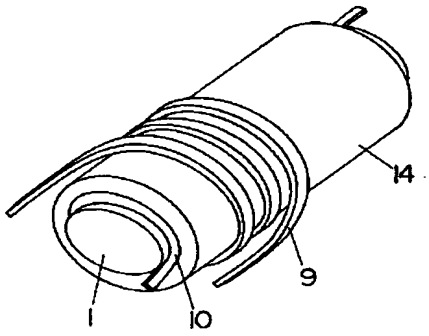


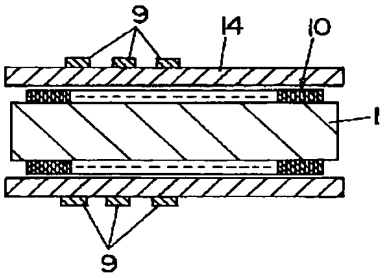
【図25】



【図26】



【図27】



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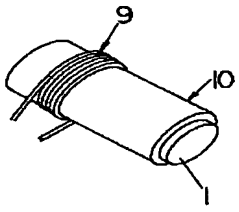

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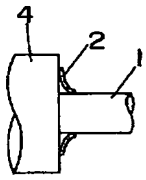

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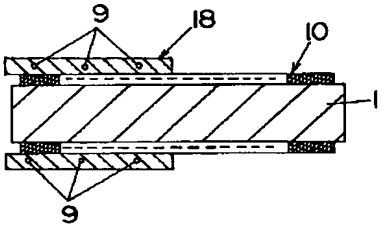

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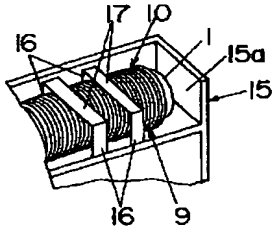

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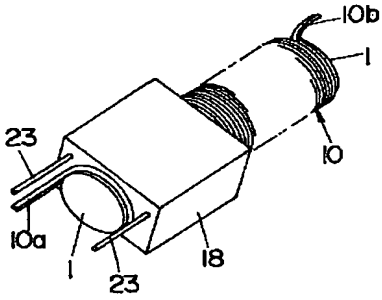

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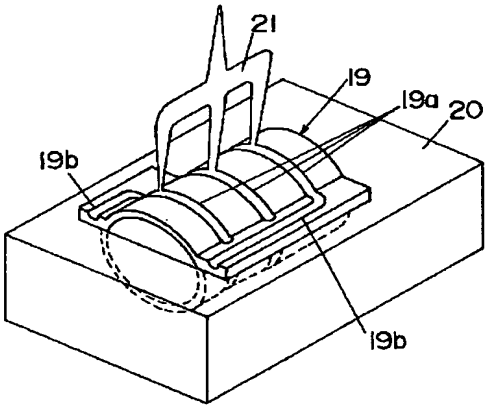

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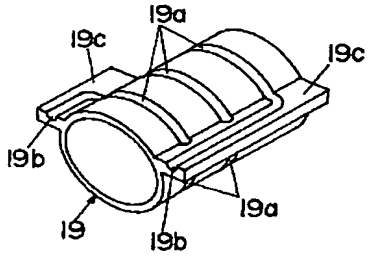

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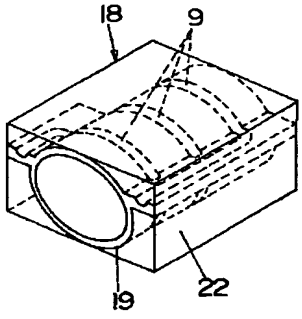

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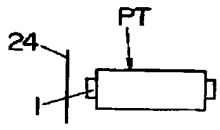

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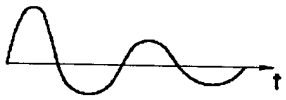

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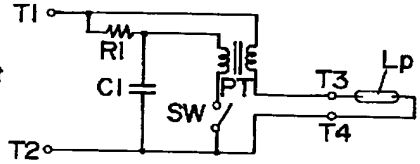

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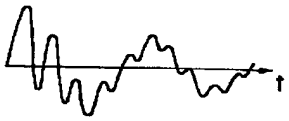

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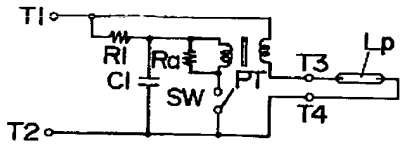

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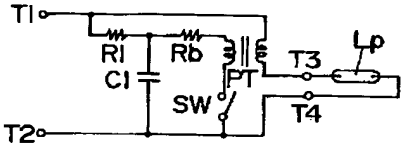

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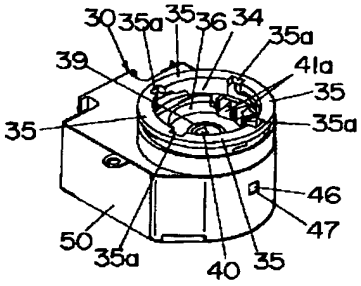

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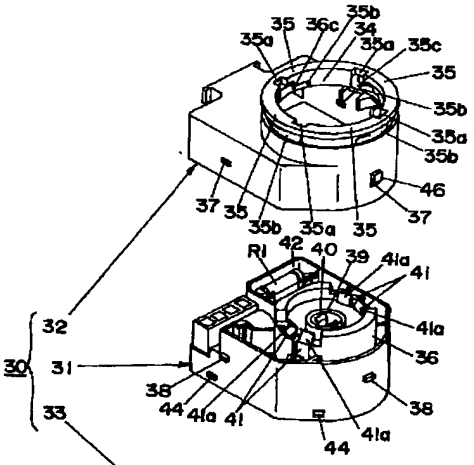

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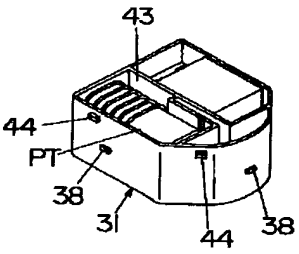

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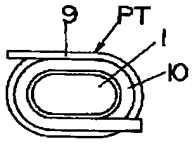

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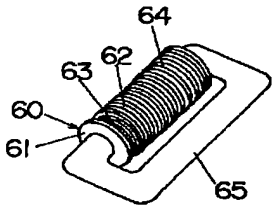

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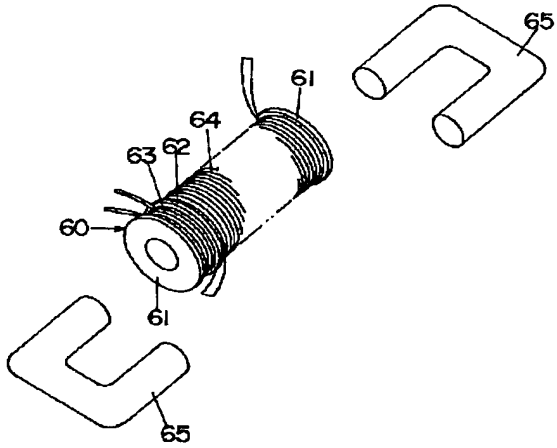

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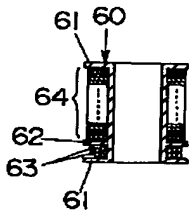

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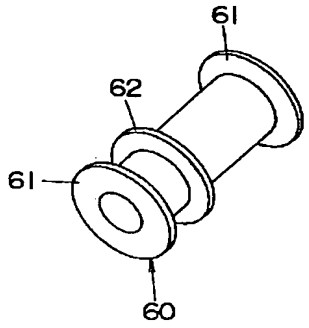

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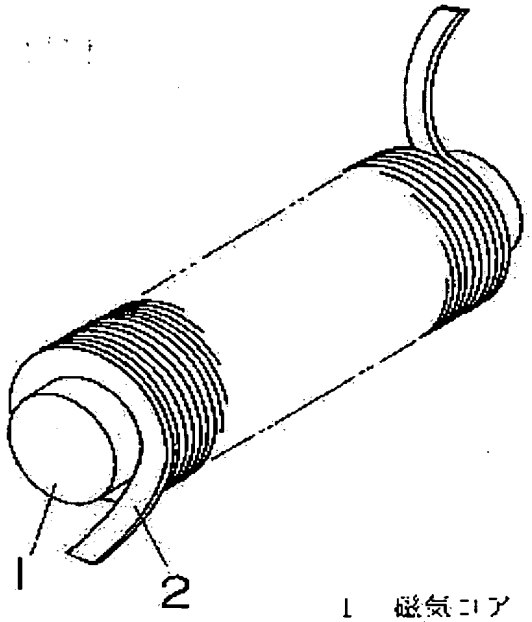
(54) MAGNETIC DEVICE AND HIGH-VOLTAGE GENERATING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a magnetic device, having a low profile and superior performance, and a high-voltage generating device.
SOLUTION: A magnetic core 1 is formed on a Ni-Zn ferrite material, having a large resistivity (specific resistance) in a cylindrical shape. A winding is formed by winding edgewise a flat rectangular conductor 2 around almost the full length of the magnetic core 1 in a single layer. In this manner, the flat rectangular conductor 2 is wound around the magnetic core 1 which is formed of the material having a large resistivity to form the magnet device, to thereby eliminate the need for an insulating member, such as a coil bobbin between the magnetic core 1 and the winding (flat rectangular conductor 2). This reduces the outer shape and the thickness of the winding and thus makes the magnetic device low-profiled. Further, because the flat rectangular conductor 2 is wound directly around the magnetic core 1, the length of the winding is shortened to reduce the resistance of the winding. Still further, because a gap is not produced between the magnetic core 1 and the winding, for example, when a comparison is made in the same size and the same number of windings, self-inductance can be reduced.



1 磁気コア
2 平角導線

LEGAL STATUS

[Date of request for examination] 27.01.2004
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than

[Claim(s)]

[Claim 1] the electromagnetism characterized by ****(ing) said coil because resistivity is equipped with the magnetic core which has the property of 1000 or more ohm-m, and the coil ****(ed) by carrying out abbreviation contact over the perimeter of a magnetic core and carries out the direct edge WAIZU volume of the straight angle lead wire to a magnetic core -- equipment.

[Claim 2] the electromagnetism according to claim 1 characterized by ****(ing) other 1 thru/or two or more coils on said coil -- equipment.

[Claim 3] the electromagnetism according to claim 2 characterized by welding covering of said coil ****(ed) by the magnetic core by carrying out abbreviation contact, and the coil ****(ed) on the coil concerned -- equipment.

[Claim 4] electromagnetism claim 1 characterized by considering the front face of a magnetic core as a coarse result, 2, or given in three -- equipment.

[Claim 5] the electromagnetism according to claim 2 characterized by for straight angle lead wire having arranged the magnetic core by which the edge WAIZU volume was carried out, and joining said leads among two or more leads -- equipment.

[Claim 6] the 1st insulating member in which said magnetic core which was formed in the cartridge and wound straight angle lead wire is inserted, the coil which buries conductive resin into the slot formed in the peripheral face of the 1st insulating member, and is formed in it, and the electromagnetism according to claim 2 characterized by having the 2nd insulating member of a wrap for the periphery of the 1st insulating member -- equipment.

[Claim 7] the electromagnetism according to claim 6 characterized by having used as the secondary coil said coil which consists of straight angle lead wire, and using as a primary coil the coil formed in the peripheral face of said 1st insulating member -- equipment.

[Claim 8] the electromagnetism according to claim 7 characterized by having arranged said primary coil to the low-battery close-attendants side of said secondary coil -- equipment.

[Claim 9] the electromagnetism indicated by any of claims 2-8 they are -- the high-voltage transformer assembly characterized by having the pulse transformer which consists of equipment, the capacitor by which parallel connection was carried out to the primary coil of a pulse transformer, the switch element which open and close the discharge path from a capacitor to a primary coil, and the resistance connected to a serial or juxtaposition at a primary coil.

[Claim 10] the electromagnetism indicated by any of claims 2-8 they are -- the high-voltage transformer assembly characterized by having the pulse transformer which consists of equipment, the capacitor by which parallel connection was carried out to the primary coil of a pulse transformer, the switch element which open and close the discharge path from a capacitor to a primary coil, and the metal plate of said pulse transformer used as an open magnetic circuit

arranged in an end close-attendants side at least.

[Claim 11] the body of equipment which holds said pulse transformer, a capacitor, and a switch element at least -- having -- this body of equipment -- the lamp of a discharge lamp -- the high-voltage pulse which a mouthpiece prepares the socket section connected electrically and mechanically, and generates in the secondary coil of said pulse transformer through this socket section -- a lamp -- the high-voltage transformer assembly according to claim 10 characterized by being impressed by the mouthpiece.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention -- electromagnetism -- it is related with equipment and a high-voltage transformer assembly.

[0002]

[Description of the Prior Art] electromagnetism like [in order to put a high-pressure discharge lamp like a HID lamp into operation conventionally, the equipment (high-voltage transformer assembly) which generates the high voltage called an ignitor is required, and] the pulse transformer which changes the input of a low battery into a high-voltage transformer assembly at a pulse-like high-voltage output -- equipment is used.

[0003] the conventional electromagnetism -- the thing of structure as shown in drawing 46 - drawing 49 as equipment is offered. The coil bobbin 60 is formed in a cylindrical shape with an insulating ingredient like synthetic resin, and while the outside flange section 61 is formed in both ends, the separation flange 62 is formed between both the outside flange sections 61. Between one outside flange section 61 and the separation flange 62, the primary coil 63 which is a low-battery side is wound, and the secondary coil 64 which is a high-voltage side is wound between the outside flange section 61 of another side, and the separation flange 62. In addition, the secondary coil 64 is constituted from winding foil-like straight angle lead wire with thin thickness so that the broad field may counter (the so-called edge WAIZU volume), and improvement in surface insulation and improvement in a coil pulse duty factor are achieved. and the magnetic core 65 of the shape of a KO character which becomes the coil bobbin 60 around which the primary coil 63 and the secondary coil 64 were wound from a Mn-Zn ferrite -- insertion immobilization -- carrying out -- electromagnetism -- equipment (pulse transformer) is formed.

[0004]

[Problem(s) to be Solved by the Invention] by the way, the halogen lamp of the former [viewpoint / which thinks safety as important in the headlight for automobiles (headlight) in recent years] -- high brightness, a low power, and a long lasting HID lamp -- a high-pressure discharge lamp [like] uses it -- having -- coming -- **** -- the rapid spread of high-pressure

discharge lamps -- following -- the electromagnetism of a very thin shape [constraint / of an ignitor / dimensional] -- equipment is demanded. However, conventionally [above-mentioned], since the coil bobbin 60 intervenes between a magnetic core 65 and a coil with equipment, thin-shape-izing is very difficult, and moreover, in order to require the clearance between insertion between the coil bobbin 60 and a magnetic core 65, the distance between a magnetic core 65 and a coil becomes long, a property falls, and it has the fault that dispersion is large. In addition, although the thing using insulating covering made of resin is also proposed instead of the coil bobbin (refer to JP,2000-36416,A), there is same fault too.

[0005] the electromagnetism which has the engine performance which excelled [place / which succeeds in the invention in this application in view of the above-mentioned situation, and is made into the purpose] in the thin shape -- it is in offering equipment and a high-voltage transformer assembly.

[0006]

[Means for Solving the Problem] The magnetic core in which resistivity has the property of 1000 or more ohm-m in order that invention of claim 1 may attain the above-mentioned purpose, It has the coil ****(ed) by carrying out abbreviation contact over the perimeter of a magnetic core, and is characterized by ****(ing) said coil by carrying out the direct edge WAIZU volume of the straight angle lead wire to a magnetic core. the electromagnetism which has the engine performance which insulating materials, such as a coil bobbin, became unnecessary, could form the appearance of a coil small and thinly between the magnetic core and the coil (straight angle lead wire), and was excellent in the thin shape -- equipment can be offered.

[0007] In invention of claim 1, invention of claim 2 is characterized by ****(ing) other 1 thru/or two or more coils on said coil, and can realize a thin transformer.

[0008] Invention of claim 3 can be characterized by welding covering of said coil ****(ed) by the magnetic core by carrying out abbreviation contact in invention of claim 2, and the coil ****(ed) on the coil concerned, can perform positioning between coils by welding covering of two or more coils, and can prevent dispersion in the property by the relative location between coils shifting etc.

[0009] In invention of claim 1, 2, or 3, it is characterized by considering the front face of a magnetic core as a coarse result, post processing, such as polish after forming a magnetic core, becomes unnecessary, and invention of claim 4 can lower the manufacturing cost of a magnetic core. Moreover, it can prevent straight angle lead wire being slippery and buckling it in the case of an edge WAIZU volume.

[0010] In invention of claim 2, invention of claim 5 arranges the magnetic core to which the edge WAIZU volume of the straight angle lead wire was carried out among two or more leads, is characterized by joining said leads, and does so the same operation as invention of claim 2.

[0011] The 1st insulating member in which said magnetic core which invention of claim 6 was formed in the cartridge in invention of claim 2, and wound straight angle lead wire is inserted, The coil which buries conductive resin into the slot formed in the peripheral face of the 1st insulating member, and is formed in it, It is characterized by having the 2nd insulating member of a wrap for the periphery of the 1st insulating member. The insulation between the coil which consists of straight angle lead wire by the 1st insulating member, and the coil which consists of conductive resin is attained. Moreover, since the whole is covered by the 2nd insulating member which has insulation after forming a coil in the peripheral face of the 1st insulating member with conductive resin, the insulation between the coils which consist of the terminal and conductive resin by the side of the high voltage of the coil which consists of straight angle lead wire is securable.

[0012] In invention of claim 6, invention of claim 7 is characterized by having used as the secondary coil said coil which consists of straight angle lead wire, and using as a primary coil the coil formed in the peripheral face of said 1st insulating member, and does so the same operation as invention of claim 6.

[0013] In invention of claim 7, invention of claim 8 can be characterized by having arranged said primary coil to the low-battery close-attendants side of said secondary coil, can fully secure the creeping distance between primary coils the high-voltage side of a secondary coil, and can aim at insulating improvement.

[0014] the electromagnetism indicated by any of claims 2-8 they are in order that invention of claim 9 might attain the above-mentioned purpose -- with the pulse transformer which consists of equipment The capacitor by which parallel connection was carried out to the primary coil of a pulse transformer, and the switch element which open and close the discharge path from a capacitor to a primary coil, It is characterized by equipping a primary coil with the resistance connected to a serial or juxtaposition, and between a magnetic core and a coil (straight angle lead wire), insulating materials, such as a coil bobbin, can become unnecessary, the appearance of a coil can be formed small and thinly, and the high-voltage transformer assembly which has the engine performance excellent in the thin shape can be offered. Moreover, the wave of the high-voltage pulse outputted from the secondary coil of a pulse transformer can be made into the wave near a fundamental wave, since it can be promptly completed by vibration of an electrical potential difference, the stress concerning passive circuit elements, such as a capacitor, can be eased, vibration of an electrical potential difference can be controlled by loss of the resistance which carried out parallel connection to the primary coil, and a pressure-proof low small and cheap thing can be used for passive circuit elements.

[0015] the electromagnetism indicated by any of claims 2-8 they are in order that invention of claim 10 might attain the above-mentioned purpose -- with the pulse transformer which consists

of equipment The capacitor by which parallel connection was carried out to the primary coil of a pulse transformer, and the switch element which open and close the discharge path from a capacitor to a primary coil, It is characterized by having the metal plate of said pulse transformer used as an open magnetic circuit arranged in an end close-attendants side at least. Between a magnetic core and a coil (straight angle lead wire), insulating materials, such as a coil bobbin, can become unnecessary, the appearance of a coil can be formed small and thinly, and the high-voltage transformer assembly which has the engine performance excellent in the thin shape can be offered. Moreover, the wave of the high-voltage pulse outputted from the secondary coil of a pulse transformer can be made into the wave near a fundamental wave, since it can be promptly completed by vibration of an electrical potential difference, the stress concerning passive circuit elements, such as a capacitor, can be eased, vibration of an electrical potential difference can be controlled by the eddy current loss produced in a metal plate, and a pressure-proof low small and cheap thing can be used for passive circuit elements.

[0016] Invention of claim 11 is set to invention of claim 10. At least Said pulse transformer, The socket section to which a mouthpiece is connected electrically and mechanically is prepared. the body of equipment which holds a capacitor and a switch element -- having -- this body of equipment -- the lamp of a discharge lamp -- the high-voltage pulse generated in the secondary coil of said pulse transformer through this socket section -- a lamp -- being impressed by the mouthpiece -- the description -- carrying out -- the lamp of a discharge lamp -- the thin high-voltage transformer assembly which equipped one with the socket to which a mouthpiece is connected can be offered.

[0017]

[Embodiment of the Invention] (Operation gestalt 1) the electromagnetism of this operation gestalt -- equipment is the inductor of a single coil, without minding insulating materials, such as a coil bobbin, winds a coil around the magnetic core 1 of the rod form formed in the shape of an approximate circle column as shown in drawing 1 and drawing 2 directly, and is formed in it.

[0018] A magnetic core 1 is formed with a diameter of about 8mm in the shape of a cylinder using nickel-Zn ferrite material (for example, L11H material by TDK Corp.) with large resistivity (specific resistance). moreover, a coil is formed by the thing of a magnetic core 1 which it is further alike and is mostly done for an edge WAIZU volume covering an overall length in the straight angle lead wire (for example, straight angle ribbon EDW line by Optec Dai-Ichi Denko Co., Ltd. (thickness of 70 micrometers, width of face of 1.4mm)) 2. It fixes near the shaft-orientations both-ends side of a magnetic core 1 with a jig, and specifically, it is carrying out with the new method of construction of involving the straight angle lead wire 2 in a magnetic core 1 at the same time it rotates a magnetic core 1 by rotating a jig.

[0019] When the pre-insulation of the straight angle lead wire 2 after winding around a

magnetic core 1 was investigated about this operation gestalt formed as mentioned above, it turned out that the insulation between a magnetic core 1 and a coil (straight angle lead wire 2) and the insulation between coils are fully secured. In addition, it turned out that there will be no abnormalities especially in an insulating property about the insulation between a magnetic core 1 and a coil if resistivity is 1000 or more ohm-m although it was surmised that there was relation with the resistivity which is the insulating index of a magnetic core 1. Moreover, it turned out that there is no degradation also about magnetic properties and an electrical property.

[0020] the magnetic core 1 formed with the ingredient as mentioned above with large resistivity -- the straight angle lead wire 2 -- a direct edge WAIZU volume -- carrying out -- electromagnetism -- by forming equipment, the insulating material of coil bobbin 60 grade is unnecessary between a magnetic core 1 and a coil (straight angle lead wire 2) -- becoming -- the appearance of a coil -- small -- and -- thin -- forming -- electromagnetism -- thin shape-ization of equipment can be attained. Moreover, since the straight angle lead wire 2 is directly wound around the magnetic core 1, the overall length of a coil becomes short and can make a wirewound resistor small. Furthermore, since an opening is not generated between a magnetic core 1 and a coil, a self-inductance can be made small when this dimension and these number of turns compare, for example. And although the relative physical relationship of a magnetic core and a coil became unstable by the opening produced between a magnetic core and a coil and it had become the cause by which characteristic values, such as an inductance value, varied, with the configuration conventionally which carried out the edge WAIZU volume of the straight angle lead wire to insulating materials, such as a coil bobbin Since adhesion maintenance of the coil is firmly carried out at a magnetic core 1 by winding the straight angle lead wire 2 around a magnetic core 1 directly, both relative location is fixed and dispersion in a property can also be made very small.

[0021] (Operation gestalt 2) This operation gestalt has the description in the point that the cross-section configuration is formed in the shape of [of an ellipse form] a rod in the magnetic core 1, as shown in drawing 3 , gives the same sign to the configuration which is common in the operation gestalt 1 about other configurations since it is common, and omits explanation.

[0022] A cross-section configuration is formed by the magnetic core 1 in the shape of [of an ellipse form] a rod using nickel-Zn ferrite material like the operation gestalt 1, and the direct edge WAIZU volume of the straight angle lead wire 2 is carried out. Thus, when the cross-section configuration formed the magnetic core 1 in the shape of [of an ellipse form] a rod, there is an advantage that low back-ization can be attained as compared with the operation gestalt 1.

[0023] By the way, the crevice 3 of the shape of a semi-sphere with a diameter of about 2mm is cut in the core of the both-ends side of a magnetic core 1, and as shown in drawing 4 , in case

the straight angle lead wire 2 is wound, he is trying to fix a jig 4 and a magnetic core 1 by fitting into a crevice 3 projection 4a which the jig 4 for rotation has. The revolving shaft of a magnetic core 1 can become fixed by this, turbulence of the rotation produced by dimension dispersion of a magnetic core 1 etc. can be suppressed as much as possible, and the straight angle lead wire 2 can be wound around homogeneity.

[0024] (Operation gestalt 3) This operation gestalt has the description in the point that the through tube 5 is formed on the medial axis of a magnetic core 1, as shown in drawing 5 , and other configurations give the same sign to the configuration which is common in the operation gestalt 2 since it is common, and omit explanation.

[0025] The through tube 5 with a diameter of about 2mm is formed on the medial axis to which as for a magnetic core 1 a cross-section configuration is formed in in the shape of [of an ellipse form] a rod, and connects the core of a both-ends side like the operation gestalt 2. In case it ** and the straight angle lead wire 2 is wound like the operation gestalt 2, a jig 4 and a magnetic core 1 can be fixed by fitting projection 4a of a jig 4 into a through tube 5. Furthermore, a magnetic core 1 is firmly fixable to a case 7 by inserting in a through tube 5 the projection 6 of the shape of a rod which protruded on the cases 7, such as an instrument, as shown in drawing 6 . In addition, **** for immobilization may be used as a projection 6. Moreover, a magnetic core 1 may be formed in the shape of a cylinder as well as the operation gestalt 1.

[0026] (Operation gestalt 4) This operation gestalt has the description in the point that the outside flange section 8 which projects outside over the abbreviation perimeter is formed in the both ends of a magnetic core 1, as shown in drawing 7 - drawing 9 , and other configurations give the same sign to the configuration which is common in the operation gestalt 2 since it is common, and omit explanation.

[0027] The outside flange section 8 in which a cross-section configuration is formed in the shape of [of an ellipse form] a rod, and projects in longitudinal direction both ends in the direction (outside) which carries out an abbreviation rectangular cross with a longitudinal direction over the abbreviation perimeter is formed by the magnetic core 1 like the operation gestalt 2. That is, although there is a possibility of the both ends of the straight angle lead wire 2 by which the edge WAIZU volume was carried out being unstable, and solving, it can prevent the straight angle lead wire 2 of an edge interfering with the outside flange section 8 by forming the outside flange section 8, and the straight angle lead wire 2 coming loose.

[0028] Moreover, in case the crevice 3 of semi-sphere-like plurality (this operation gestalt two pieces) is cut in the both-ends side of a magnetic core 1 and the straight angle lead wire 2 is wound, he is trying to fix a jig 4 and a magnetic core 1 more firmly by fitting into each crevice 3 two or more projection 4a which the jig 4 for rotation has. Thereby, as compared with the operation gestalt 2, it is stabilized further and the straight angle lead wire 2 can be wound. In

addition, a magnetic core 1 may be formed in the shape of a cylinder as well as the operation gestalt 1.

[0029] (Operation gestalt 5) This operation gestalt has the description in the configuration of a magnetic core 1, gives the same sign to the configuration which is common in the operation gestalt 1 about other configurations since it is common, and omits explanation.

[0030] As the magnetic core 1 of this operation gestalt is shown in drawing 10 , the diameter of the cross section is formed in the configuration which becomes small gradually toward a center from the both ends of a longitudinal direction, and as shown in drawing 11 , the direct edge WAIZU volume of the straight angle lead wire 2 is carried out. By having formed the magnetic core 1 in the above configurations, the peripheral surface of the magnetic core 1 around which the straight angle lead wire 2 is wound turns into an inclined plane which inclines towards a center from both ends, the both ends of the straight angle lead wire 2 do not spread outside along with the longitudinal direction of a magnetic core 1, and it can fix to stability. In addition, a cross-section configuration may form a magnetic core 1 in the shape of [of an ellipse form] a rod like the operation gestalt 2.

[0031] (Operation gestalt 6) the electromagnetism of this operation gestalt -- equipment is the transformer of two coils, without minding insulating materials, such as a coil bobbin, winds a primary coil and a secondary coil around the magnetic core 1 of the rod form formed in the shape of an approximate circle column as shown in drawing 12 directly, and is formed in it.

[0032] A magnetic core 1 is the thing of the same configuration as the operation gestalt 1, and the primary coil 9 and the secondary coil 10 are formed by the direct edge WAIZU volume of the straight angle lead wire 2 being carried out. Thus, since the primary coil 9 and the secondary coil 10 are formed by carrying out the direct edge WAIZU volume of the straight angle lead wire 2 to a magnetic core 1, while being able to attain a miniaturization conventionally which winds a coil around a coil bobbin as compared with a configuration, the direct current resistance of the primary coil 9 and the secondary coil 10 can be decreased, and the transformer which has the outstanding engine performance can be realized. Moreover, since the primary coil 9 and the secondary coil 10 are separated and formed in the longitudinal direction of a magnetic core 1, the insulation between both coils is securable. In addition, a cross-section configuration may form a magnetic core 1 in the shape of [of an ellipse form] a rod like the operation gestalt 2.

[0033] (Operation gestalt 7) This operation gestalt has the description in the configuration of a magnetic core 1, gives the same sign to the configuration which is common in the operation gestalt 6 about other configurations since it is common, and omits explanation.

[0034] As the magnetic core 1 of this operation gestalt is shown in drawing 13 , the outside flange sections 8a and 8b which project in the direction (outside) which carries out an abbreviation rectangular cross with a longitudinal direction over the abbreviation perimeter are

formed in longitudinal direction both ends, and the separation flange 11 which projects in the direction (outside) which carries out an abbreviation rectangular cross with a longitudinal direction covering the location from one edge is formed in the abbreviation perimeter from the center of a longitudinal direction.

[0035] Between one outside flange section 8a and the separation flange 11, the direct edge WAIZU volume of the straight angle lead wire 2 is carried out, the primary coil 9 is formed, between outside flange section 8b of another side, and the separation flange 11, the direct edge WAIZU volume of the straight angle lead wire 2 is carried out, and the secondary coil 10 is formed.

[0036] While rose injury prevention of the edge of the straight angle lead wire 2 by which the edge WAIZU volume was carried out is regulated and carried out in the outside flange sections 8a and 8b by **(ing) and forming the outside flange sections 8a and 8b The insulation between both the coils 9 and 10 is certainly securable as compared with the operation gestalt 6 because the separation flange 11 which is a part of magnetic core 1 intervenes between the primary coil 9 and the secondary coil 10. In addition, a cross-section configuration may form a magnetic core 1 in the shape of [of an ellipse form] a rod like the operation gestalt 2.

[0037] (Operation gestalt 8) This operation gestalt has the description in the configuration of a magnetic core 1, gives the same sign to the configuration which is common in the operation gestalt 7 about other configurations since it is common, and omits explanation.

[0038] As the magnetic core 1 of this operation gestalt is shown in drawing 15 , the diameter of the cross section is formed in the configuration which becomes small gradually toward the interstitial segment of an edge and a center section from each edge between each edge and abbreviation center sections except the outside flange sections 8a and 8b of a longitudinal direction, as shown in drawing 16 , the direct edge WAIZU volume of the straight angle lead wire 2 is carried out between each edge and a center section, and the primary coil 9 and the secondary coil 10 are formed in it. In addition, the same crevice 3 as the operation gestalt 2 is cut in the core of the both-ends side of a magnetic core 1.

[0039] By having **(ed) and having formed the magnetic core 1 in the above configurations, the peripheral surface of the magnetic core 1 of the part in which the primary coil 9 and the secondary coil 10 are formed turns into an inclined plane which inclines towards an interstitial segment from both ends, the both ends of the straight angle lead wire 2 do not spread outside along with the longitudinal direction of a magnetic core 1, and it can fix to stability. And between a primary coil, 9, and the secondary coil 10, since the diameter of the cross section of a magnetic core 1 is larger than the diameter of the cross section of the part which wound the straight angle lead wire 2, there is an advantage that the insulation between both the coils 9 and 10 is certainly securable as compared with the operation gestalt 6. In addition, a cross-section

configuration may form a magnetic core 1 in the shape of [of an ellipse form] a rod like the operation gestalt 2.

[0040] (Operation gestalt 9) the electromagnetism of this operation gestalt -- equipment is the transformer of two coils, without minding insulating materials, such as a coil bobbin, winds a primary coil and a secondary coil around the magnetic core 1 of the rod form formed in the shape of an approximate circle column as shown in drawing 17 directly, and is formed in it.

[0041] A magnetic core 1 is formed in the shape of [which has the cross-section configuration of the abbreviation ellipse form which combined the rectangle and the semicircle using nickel-Zn ferrite material (for example, K5 material by Tomita Electric, Inc.) as shown in drawing 19] a rod. With this operation gestalt, the die length of about 5mm and a longitudinal direction is set [the diameter of the semicircle part of a cross section] to about 30mm for the die length of about 6mm and a rectangle part. Moreover, the crevice 3 a diameter and whose depth are about 2mm is cut in the core of the both-ends side of a magnetic core 1.

[0042] the secondary coil 10 is formed in the magnetic core 1 by coming out further and carrying out the 220 turn extent edge WAIZU volume of the straight angle lead wire 2 (for example, straight angle ribbon EDW and H rays by Optec Dai-Ichi Denko Co., Ltd. (thickness of 0.070mm, width of face of 1.4mm)) directly. Here, the direct current resistance of the secondary coil 10 in this operation gestalt was about 1.8ohms. As shown in drawing 17 and drawing 18 , it applies in the center of a longitudinal direction of a magnetic core 1 near the terminal 10a by the side of the low battery of the secondary coil 10. From the secondary coil 10 to moreover, an electric wire The primary coil 9 is formed by carrying out 6 turn extent winding of (the for example, three-layer insulated-wire TIW-E line (conductor the path of 0.2mm, the result outer diameter of 0.51mm) by Totoku Electric Co., Ltd.) (however, the case where 3 turn extent winding is carried out in drawing 17 and drawing 18 is illustrated).

[0043] Since this operation gestalt is constituted as mentioned above, the magnetic coupling between both the coils 9 and 10 becomes strong by winding the primary coil 9 on the secondary coil 10, and it can improve the transmission efficiency of power. Consequently, when both the coils 9 and 10 are used for a magnet coil 1 as a pulse transformer like the operation gestalt 7 or the operation gestalt 8 as compared with the structure which carries out sectional winding, a high secondary electrical potential difference can be obtained. For example, when a primary electrical potential difference was set to 600V, it became possible to obtain an about 30kV pulse output with peak value. Moreover, by forming the primary coil 9 near the terminal 10a by the side of the low battery of the secondary coil 10, the creeping distance between terminal 10b by the side of the high voltage of the secondary coil 10 and the primary coil 9 can fully be secured, and insulating improvement can be aimed at. And the insulation between both the coils 9 and 10 is fully securable by forming the primary coil 9 with the thick electric wire of covering. In

addition, as shown in drawing 20 , even if it adjoins terminal 10a by the side of the low battery of the secondary coil 10 in the longitudinal direction of a magnet coil 1 and forms the primary coil 9, it is possible to do the same effectiveness so.

[0044] (Operation gestalt 10) the electromagnetism of this operation gestalt -- equipment is the transformer of two coils and the primary coil 9 and the secondary coil 10 are formed by carrying out the edge WAIZU volume of straight angle lead-wire 2a and the 2b, without minding [of the rod form formed in the shape of an approximate circle column as shown in drawing 21 and drawing 22 / 1] insulating materials, such as a coil bobbin.

[0045] A magnetic core 1 is the thing of the same configuration as the operation gestalt 1, and the secondary coil 10 is formed by the direct edge WAIZU volume of the straight angle lead-wire 2b being carried out to the whole abbreviation for a longitudinal direction. Furthermore, the primary coil 9 is formed by carrying out the edge WAIZU volume of the number turn pile ****** lead-wire 2a to straight angle lead-wire 2b which forms the secondary coil 10 near the terminal 10a by the side of the low battery of the secondary coil 10 in the longitudinal direction of a magnetic core 1.

[0046] since [thus,] the primary coil 9 and the secondary coil 10 are formed by carrying out the direct edge WAIZU volume of straight angle lead-wire 2a and the 2b to a magnetic core 1 -- the dimension of the primary coil 9 -- the dimension of the secondary coil 10 -- abbreviation -- equal -- becoming -- the operation gestalt 9 -- comparing -- electromagnetism -- a miniaturization and thin-shape-izing of equipment are attained. Moreover, since the primary coil 9 also carries out the direct edge WAIZU volume of the straight angle lead-wire 2a to a magnetic core 1 and forms it in it, there is an advantage that both the coils 9 and 10 can be produced at the same process, and improvement in productivity can be aimed at. [as well as the secondary coil 10]

[0047] (Operation gestalt 11) This operation gestalt has the description in the structure of the primary coil 9, gives the same sign to the configuration which is common in the operation gestalt 9 about other configurations since it is common, and omits explanation.

[0048] As shown in drawing 23 and drawing 24 , the primary coil 9 in this operation gestalt is formed by winding by turns on the primary coil 10 formed in the magnetic core 1 by carrying out the direct edge WAIZU volume of the straight angle lead wire 2 in the rectangle-like electric conduction foil 12 and the insulating rectangle sheet-like film 13. In addition, thin band-like piece of terminal 12a is formed in the both ends of the end edge of the electric conduction foil 12, and such piece of terminal 12a is used as the terminal of the primary coil 9.

[0049] The production process of the primary coil 9 is explained in more detail. If it twists on the secondary coil 10 which laid the electric conduction foil 12 in the end side of the insulating rectangle sheet-like film 13 as shown in drawing 25 , and was wound around the magnetic core

1 from the other end side After the insulating film 13 is first wound on the secondary coil 10, the primary coil 9 is formed by the electric conduction foil 12 and the insulating film 13 being wound by turns, and the electric conduction foil 12 being wound around a multilayer through the insulating film 13 on the secondary coil 10, as shown in drawing 24 . According to the above-mentioned configuration, the insulation between the secondary coil 10 and the primary coil 9 and the insulation between the electric conduction foils 12 are securable for coincidence with the insulating film 13. In addition, in this operation gestalt, it applies in the center of a longitudinal direction of a magnet coil 1 near the terminal 10a by the side of the low battery of the secondary coil 10, and the primary coil 9 is formed.

[0050] since the primary coil 9 is formed with the thin electric conduction foil 12 and the insulating film 13 of thickness as mentioned above -- electromagnetism -- while being able to attain much more thin shape-ization of equipment, distance between the primary coil 9 and the secondary coil 10 can be shortened, magnetic coupling can be strengthened, and there is an advantage that can improve the transmission efficiency of power and high output voltage is obtained. and the conductor of the primary coil 9 -- since the large cross section can be taken, direct current resistance is decreased and there is also an advantage that a big primary current is acquired.

[0051] (Operation gestalt 12) This operation gestalt has the description in the structure of the primary coil 9, gives the same sign to the configuration which is common in the operation gestalt 9 about other configurations since it is common, and omits explanation.

[0052] As shown in drawing 26 and drawing 27 , with this operation gestalt, the magnetic core 1 in which the direct edge WAIZU volume of the straight angle lead wire 2 was carried out, and the secondary coil 10 was formed is inserted into the insulating case 14 formed approximately cylindrical with the insulating material, on this insulating case 14, an electric wire is wound and the primary coil 9 is formed. The insulating case 14 was formed in the dimension which is not shorter than the overall length of the longitudinal direction of a magnetic core 1, and has covered the magnetic core 1 inserted in the interior, and the whole secondary coil 10.

[0053] And the primary coil 9 is formed by applying in the center of a longitudinal direction of a magnetic core 1 near the terminal 10a by the side of the low battery of the secondary coil 10, and carrying out number turn winding of the electric wire (for example, straight angle lead wire) from on the insulating case 14.

[0054] Since it ** and constitutes from this operation gestalt as mentioned above, while the insulation between the primary coil 9 and the secondary coil 10 is securable in the insulating case 14, since the insulating case 14 has covered the secondary coil 10 whole, dielectric breakdown through the surface from terminal 10b by the side of the high voltage of the secondary coil 10 to the primary coil 9 can also be prevented.

[0055] (Operation gestalt 13) This operation gestalt has the description in the structure of the primary coil 9, gives the same sign to the configuration which is common in the operation gestalt 9 about other configurations since it is common, and omits explanation.

[0056] This operation gestalt has the description in the point of having been made to position the primary coil 9 by carrying out welding of covering of the straight angle lead wire 2 and covering of the above-mentioned electric wire which form winding and the secondary coil 10 for the electric wire covered with the resin which has welding nature as shown in drawing 28 on the secondary coil 10.

[0057] It **, and since the primary coil 9 can be positioned by welding covering of both the coils 9 and 10, dispersion in the property by the relative location of the primary coil 9 shifting etc. can be prevented. In addition, covering of the straight angle lead wire 2 by which the direct edge WAIZU volume was carried out also to covering of the straight angle lead wire 2 which forms the secondary coil 10 at the magnetic core 1 using the resin which has welding nature is welded to a magnetic core 1, and it may be made to position the secondary coil 10.

[0058] (Operation gestalt 14) This operation gestalt has the description in the structure of the primary coil 9, gives the same sign to the configuration which is common in the operation gestalt 9 about other configurations since it is common, and omits explanation.

[0059] As shown in drawing 29 , insert molding of the lead 16 set to hold section 15a of the case 15 made of synthetic resin from a thin metal plate etc. is carried out. The magnetic core 1 in which the direct edge WAIZU volume of the straight angle lead wire 2 was carried out, and the secondary coil 10 was formed is held in the above-mentioned hold section 15a, the piece 17 of a lead which consists of a thin metal plate etc. is constructed across between the tips of the lead 16 which counters on both sides of a magnetic core 1, and the both ends of the piece 17 of a lead and the point of each lead 16 are joined. Consequently, lead 16 and the piece 17 of a lead will be wound around the perimeter of the secondary coil 10, and the primary coil 9 will be formed of lead 16 and the piece 17 of a lead.

[0060] if constituted as mentioned above -- electromagnetism -- miniaturization of equipment (transformer) and low back-ization can be attained.

[0061] since there is fear of dielectric breakdown between the primary coils 9 through a surface in (the operation gestalt 15) and time in the operation gestalt 9 from terminal 10b by the side of the high voltage of the secondary coil 10 -- the primary coil 9 -- a conductor -- the electric wire which has one about 5 times the outer diameter of a path is used. however -- if an electric wire thick in this way is used -- electromagnetism -- the outer diameter of equipment (transformer) may be enlarged and sufficient thin shape-ization may be unable to be attained depending on an application Moreover, since the insulated wire of a cross-section round shape is used as an electric wire, in case it winds on the secondary coil 10, decision of a location is not easy and

there is also a possibility that a roll gain etc. may arise. moreover -- although the wire size of the primary coil 9 becomes small in the operation gestalt 12 -- the part of the insulating case 14 -- electromagnetism -- there is a disadvantageous point that the dimension of equipment (transformer) becomes large, components mark increase or assembly becomes difficult.

[0062] then, the thing for which this operation gestalt inserts the magnetic core 1 by which the direct edge WAIZU volume of the straight angle lead wire 2 was carried out, and the secondary coil 10 was formed in the primary coil components 18 containing the primary coil 9 and an insulating material as shown in drawing 30 and drawing 31 -- electromagnetism -- equipment (transformer) is constituted. Thus, this operation gestalt has the description in the structure of the primary coil 9, gives the same sign to the configuration which is common in the operation gestalt 9 about other configurations since it is common, and omits explanation.

[0063] The primary coil components 18 have the barrel (the 1st insulating member) 19 by which the cross-section configuration was formed in tubed [of the same abbreviation ellipse form as a magnetic core 1] with the synthetic resin which has insulation as shown in drawing 32 . Number turn extent formation of the slot 19a for this barrel 19 being formed with thermoplastics like for example, polyether imide (the product made from GE, trade name "Ultem"), and forming a primary coil in a peripheral face is carried out over the perimeter. Protruding piece 19c which has slot 19b for forming the terminal of a primary [further] coil protrudes along with the longitudinal direction.

[0064] It **, and spreads round conductive resin 21 fang-furrow 19a which was excellent in the fluidity when slushing conductive resin 21 into slot 19a of the above-mentioned barrel 19 set to metal mold 20, as shown in drawing 33 , and the whole 19b, and the primary coil 9 which winds the peripheral face of a barrel 19 along Slots 19a and 19b by fully stiffening conductive resin 21 is formed.

[0065] the barrel 19 in which the primary coil 9 was formed as mentioned above -- opening of longitudinal direction both ends -- exposing -- making -- the barrel 19 whole -- synthetic resin (for example, polyether imide which forms a barrel 19) -- a wrap -- the primary coil components 18 which covered the barrel 19 by things in the shaping section (the 2nd insulating member) 22 of synthetic resin which has insulation as shown in drawing 34 are formed.

[0066] and the thing for which the magnetic core 1 by which the secondary coil 10 was formed in the barrel 19 of the primary coil components 18 is inserted, and a terminal strip 23 is attached in the terminal of the primary coil 9 -- electromagnetism -- equipment (transformer) is constituted (refer to drawing 30 and drawing 31). In addition, it is inserted in the center of a longitudinal direction of a magnetic core 1 near the terminal 10a by the side of the low battery of the secondary coil 10, covering the primary coil components 18.

[0067] Since this operation gestalt is constituted as mentioned above, the insulation between the

primary coil 9 and the secondary coil 10 is attained with the primary coil components 18. Moreover, since the barrel 19 whole is covered in the shaping section 22 made of synthetic resin which has insulation after forming the primary coil 9 in the peripheral face of a barrel 19 with conductive resin 21, the insulation between the terminal by the side of the high voltage of the secondary coil 10 and the primary coil 9 is securable. And since the primary coil 9 is formed by slushing conductive resin 12 excellent in the fluidity into the slots 19a and 19b of a barrel 19, While the winding process of an electric wire becomes unnecessary as compared with the case where wind an electric wire and a primary coil is formed, assembly becomes easy and mass-production nature improves, redundancy, such as dimension dispersion of covering of an electric wire and volume turbulence at the time of winding, is lost. the small and thin primary coil 9 -- it can form -- further -- electromagnetism -- a miniaturization and thin-shape-izing of the whole equipment can be attained.

[0068] By the way, in the operation gestalten 1-14 mentioned above in this operation gestalt list, although polish etc. is processed on the front face of a magnetic core 1 after fabricating ferrite material in the shape of a rod and forming a magnetic core 1, it is good also considering the front face of a magnetic core 1 as a coarse result, without performing such post processing. In this case, it is desirable to form a magnetic core 1 so that arithmetic mean granularity (Ra) may become coarser than about 0.8 micrometers about the surface roughness of a magnetic core 1. Post processing, such as polish after forming a magnetic core 1, becomes unnecessary by this, and the manufacturing cost of a magnetic core 1 can be lowered. And although there is a possibility of the straight angle lead wire 2 being slippery, and buckling it in the case of an edge WAIZU volume as shown in drawing 35 when performing the above-mentioned post processing and reducing the surface roughness of a magnetic core 1, the buckling of the straight angle lead wire 2 can be prevented by considering the front face of a magnetic core 1 as a coarse result as mentioned above.

[0069] (Operation gestalt 16) Drawing 38 is the outline circuitry Fig. showing an example of the conventional high-voltage transformer assembly. The input terminals T1 and T2 with which it is the ignitor which equipment impresses a high-voltage pulse to a high-pressure discharge lamp Lp conventionally [this], and is put into operation, and an electrical potential difference is impressed, The pulse transformer PT to which the secondary coil was connected with output terminal T3 and T four which are connected to the both ends of a high-pressure discharge lamp Lp between the input terminal T1 by the side of the high voltage, and output terminal T3 by the side of the high voltage, and the primary coil was connected between an input terminal T1 and T2 The switch element SW inserted between the input terminals T2 by the side of the low battery of the primary coil of a pulse transformer PT, and a low battery, It has the resistance R1 inserted between the input terminal T1 side by the side of the high voltage, and the high-voltage

side of the primary coil of a pulse transformer PT, and the capacitor C1 connected to the primary coil and the switch element SW of a pulse transformer PT at juxtaposition. If an electrical potential difference is impressed between an input terminal T1 and T2 in the condition that the high-pressure discharge lamp Lp will not be on if actuation of equipment is explained conventionally [this], a capacitor C1 will be charged through resistance R1. When the both-ends electrical potential difference of a capacitor C1 rises and a predetermined value is reached, the charge charge of a capacitor C1 discharges through the switch element SW to the primary coil of a pulse transformer PT by turning on the switch element SW, and the pulse-like high voltage occurs in the secondary coil of a pulse transformer PT. This high-voltage pulse is impressed to the both ends of a high-pressure discharge lamp Lp, makes a high-pressure discharge lamp Lp result in dielectric breakdown, and starts.

[0070] Drawing 39 shows an example of an output wave of the high-voltage pulse in equipment conventionally [above-mentioned], and serves as a wave which the high frequency component superimposed on the wave which carried out the pressure up of the resonance voltage of a capacitor C1 to the primary coil of a pulse transformer PT with the pulse transformer PT. This originates in parasitic capacitance etc. existing in fact instead of a transformer with an ideal pulse transformer PT. However, it is better to be a wave near [in order to make a high-pressure discharge lamp Lp result in dielectric breakdown promptly and to start] the fundamental wave by which the above-mentioned high frequency component was controlled. Moreover, since the stress which requires for the passive circuit elements of capacitor C1 grade the direction which vibration of an electrical potential difference converges promptly as a high-voltage transformer assembly is eased, a pressure-proof low small and cheap thing can be used for passive circuit elements.

[0071] So, with the high-voltage transformer assembly of this operation gestalt, the above-mentioned high frequency oscillation is controlled by arranging a metal plate 24 near the both ends of the magnetic core 1 of a pulse transformer PT, as shown in drawing 36 . That is, the above-mentioned high frequency oscillation is controlled because the both ends of a magnetic core 1 serve as an open magnetic circuit, the magnetic flux which originates in the above-mentioned high frequency oscillation, leaks from the both ends of a magnetic core 1, and passes a metal plate 24 changes, an eddy current flows to a metal plate 24 and eddy current loss arises. in addition, the electromagnetism which has which configuration of the operation gestalten 6-15 in the pulse transformer PT in this operation gestalt -- equipment (transformer) is used.

[0072] The above-mentioned high frequency component is controlled by the eddy current loss which is produced in a metal plate 24 according to this operation gestalt, it can consider as the wave near a fundamental wave as shows the wave of the high-voltage pulse impressed to a

high-pressure discharge lamp Lp to drawing 37 , and moreover, since it can be promptly completed by vibration of an electrical potential difference, the stress concerning the passive circuit elements of capacitor C1 grade is eased, and there is an advantage that a pressure-proof low small and cheap thing can be used for passive circuit elements. In addition, if the lead for connecting passive circuit elements electrically is arranged near the both ends of the magnetic core 1 of a pulse transformer PT and is used instead of a metal plate 24, there is an advantage that reduction of components mark and simplification of a configuration can be attained.

[0073] (Operation gestalt 17) The high-voltage transformer assembly of this operation gestalt has the description in the point of having connected Resistance Ra to the primary coil of a pulse transformer PT, and juxtaposition, as shown in drawing 40 , and the configuration of those other than this is conventionally [which was shown in drawing 38] as common as equipment. Therefore, the same sign is given to a common configuration and explanation is omitted.

[0074] It ** and the above-mentioned high frequency oscillation can be controlled by loss by the resistance Ra which carried out parallel connection to the primary coil. In addition, the same effectiveness is acquired even if it connects Resistance Rb to the primary coil of a pulse transformer PT, and a serial, as shown in drawing 41 .

[0075] (Operation gestalt 18) The high-voltage transformer assembly of this operation gestalt has the description in the socket equipped with a high-pressure discharge lamp Lp free [attachment and detachment] as shown in drawing 42 , and the point constituted by one.

[0076] The high-voltage transformer assembly of this operation gestalt is equipped with the wrap shielding covering 50 for the tooth back and peripheral surface except a front face of the body 30 of equipment made of synthetic resin, and the body 30 of equipment, as shown in drawing 43 . The body 30 of equipment assembles the body 31 with which the passive circuit elements containing the pulse transformer PT explained with the operation gestalt 16 are held, and the lid 33 which blockades the wrap covering 32 and the tooth back of the body 31 for the front face of the body 31, and is constituted.

[0077] The socket opening 34 of an approximate circle form carries out opening to the front face of covering 32, and two or more stop sections 35 of a bayonet type are formed in the hoop direction at the periphery part of this socket opening 34. The stop section 35 is formed in the periphery part of the socket opening 34 at one, and it consists of notching suitable for a core. the lamp of a high-pressure discharge lamp Lp -- with fluting 35a which makes the engagement section (not shown) prepared in the peripheral face of a mouthpiece boil and insert in the method of the back from the front of the socket opening 34 It has L typeface slot which consists of transverse groove 35b which follows this fluting 35a, and stop crevice 35c which escapes from and carries out the stop of the engagement section further in a stop location is formed in the inside.

[0078] The body 31 has the cylinder part 36 of the cylindrical shape arranged inside the socket opening 34 of covering 32, and the engagement pawl 38 which carries out concavo-convex engagement with the engagement hole 37 prepared in the peripheral surface of covering 32, and the body 31 and covering 32 are assembled in the condition that the cylinder part 36 has been arranged inside the socket opening 34, by putting covering 32 on the front face of the body 31, and engaging the engagement pawl 38 with the engagement hole 37 (refer to drawing 42). moreover, the central cylinder part 39 of a cylindrical shape protrudes on the core of the cylinder part 36 of the body 31 -- having -- **** -- the inside of this central cylinder part 39 -- a lamp -- the center electrode 40 which carries out a contact flow with the center electrode section (not shown) of a mouthpiece is contained. furthermore, a lamp -- two or more ground electrodes 41 which carry out a contact flow with the ground-electrode section (not shown) prepared in the peripheral face of a mouthpiece are attached in the cylinder part 36, and when the body 31 and covering 32 are assembled, contact section 41a of the ground electrode 41 exposed to the front-face side of a cylinder part 36 is faced inside the socket opening 34. The engagement section is inserted in fluting 35a of the stop section 35 when inserting a mouthpiece in the socket opening 34. namely, a lamp -- If a mouthpiece is rotated, the engagement section advances into transverse groove 35b, and will stop to stop crevice 35c, and a stop will be escaped and carried out to it. a lamp -- a lamp -- contact section 41a of a ground electrode 41 which the center electrode section of a mouthpiece is inserted into the central cylinder part 39, carries out a contact flow with a center electrode 40, and it faces coincidence inside the socket opening 34 -- a lamp -- by carrying out a contact flow in the ground-electrode section of a mouthpiece The high-voltage transformer assembly and high-pressure discharge lamp Lp of this operation gestalt are connected electrically and mechanically.

[0079] On the other hand, the 1st hold crevice 42 in which passive circuit elements, such as resistance R1 and a capacitor C1, are held is established in the front-face side of the body 31. Moreover, as shown in drawing 44 , the hold hollow 43 in which a pulse transformer PT is held is established in the tooth-back side of the body 31. this pulse transformer PT -- the electromagnetism of the operation gestalt 9 -- while it has the same configuration as equipment (transformer), a cross section carries out the direct edge WAIZU volume of the straight angle lead wire 2 to the magnetic core 1 of an abbreviation elliptical rod form as shown in drawing 45 , and the secondary coil 10 is formed, the primary coil 9 is formed by carrying out 6 turn extent winding of the electric wire from on the secondary coil 10.

[0080] By establishing two or more engagement slots 45 which carry out concavo-convex engagement respectively with two or more engagement projected parts 44 prepared in the peripheral surface of the body 31 in peripheral wall 33a, and a lid's 33 putting a lid 33 on the tooth back of the body 31, and engaging the engagement projected part 44 with the engagement

slot 45, a lid 33 is attached in the body 31 and the tooth back of the body 31 is blockaded with a lid 33.

[0081] The shielding covering 50 is formed in the cube type in which the whole surface carries out opening with the magnetic-substance ingredient which has conductivity, and the fitting hole 47 which carries out concavo-convex fitting with the fitting projection 46 to which it protruded on the peripheral surface of covering 32 is formed in the peripheral wall. It **, the body 30 of equipment which comes to assemble the body 31, covering 32, and a lid 33 is inserted into the shielding covering 50 from a tooth-back side, and the shielding covering 50 is attached in the body 30 of equipment by fitting the fitting projection 46 of covering 32 into the fitting hole 47.

[0082] Here, since it is arranged in the body 31 so that the both ends of the magnetic core 1 of the pulse transformer PT held in the body 30 of equipment may counter with the peripheral wall of the shielding covering 50, where the shielding covering 50 is attached in the body 30 of equipment, a closed magnetic circuit is formed with a magnetic core 1 and the shielding covering 50. Thus, while being able to control the noise emitted from a high-voltage transformer assembly by forming the body 30 of equipment with the shielding covering 50, and forming a closed magnetic circuit with the magnetic core 1 and the shielding covering 50 of a pulse transformer PT with a wrap, the output (high-voltage pulse) of a pulse transformer PT can be enlarged, and, moreover, thin shape-ization can also be attained in the miniaturization list of the whole equipment. In addition, the shielding covering 50 in this operation gestalt has also played the role of the metal plate 24 in the operation gestalt 16, and has the advantage that a metal plate 24 becomes unnecessary and reduction of components mark and simplification of a configuration can be attained.

[0083]

[Effect of the Invention] Since resistivity ****(ed) said coil by having the magnetic core which has the property of 1000 or more ohm-m, and the coil ****(ed) by carrying out abbreviation contact over the perimeter of a magnetic core, and carrying out the direct edge WAIZU volume of the straight angle lead wire to a magnetic core, invention of claim 1 the electromagnetism which has the engine performance which insulating materials, such as a coil bobbin, became unnecessary, could form the appearance of a coil small and thinly between the magnetic core and the coil (straight angle lead wire), and was excellent in the thin shape -- it is effective in the ability to offer equipment.

[0084] In invention of claim 1, since invention of claim 2 ****(ed) other 1 thru/or two or more coils on said coil, it is effective in a thin transformer being realizable.

[0085] Since invention of claim 3 welded covering of said coil ****(ed) by the magnetic core by carrying out abbreviation contact in invention of claim 2, and the coil ****(ed) on the coil concerned, it can perform positioning between coils by welding covering of two or more coils,

and is effective in the ability to prevent dispersion in the property by the relative location between coils shifting etc.

[0086] Invention of claim 4 is effective in the ability to prevent post processing, such as polish after forming a magnetic core, becoming unnecessary, and being able to lower the manufacturing cost of a magnetic core, and straight angle lead wire being slippery and buckling it, in case it is an edge WAIZU volume, since the front face of a magnetic core was considered as the coarse result in invention of claim 1, 2, or 3.

[0087] In invention of claim 2, since invention of claim 5 has arranged the magnetic core to which the edge WAIZU volume of the straight angle lead wire was carried out among two or more leads and joined said leads, it does so the same effectiveness as invention of claim 2.

[0088] The 1st insulating member in which said magnetic core which invention of claim 6 was formed in the cartridge in invention of claim 2, and wound straight angle lead wire is inserted, Since it had the 2nd insulating member of a wrap, the coil which buries conductive resin into the slot formed in the peripheral face of the 1st insulating member, and is formed in it, and the periphery of the 1st insulating member The insulation between the coil which consists of straight angle lead wire by the 1st insulating member, and the coil which consists of conductive resin is attained. Moreover, since the whole is covered by the 2nd insulating member which has insulation after forming a coil in the peripheral face of the 1st insulating member with conductive resin, it is effective in the insulation between the coils which consist of the terminal and conductive resin by the side of the high voltage of the coil which consists of straight angle lead wire being securable.

[0089] In invention of claim 6, since invention of claim 7 used as the secondary coil said coil which consists of straight angle lead wire and used as the primary coil the coil formed in the peripheral face of said 1st insulating member, it does so the same effectiveness as invention of claim 6.

[0090] In invention of claim 7, since invention of claim 8 has arranged said primary coil to the low-battery close-attendants side of said secondary coil, it is effective in the ability to fully secure the creeping distance between primary coils the high-voltage side of a secondary coil, and aim at insulating improvement.

[0091] the electromagnetism invention of claim 9 was indicated to be by any of claims 2-8 they are -- with the pulse transformer which consists of equipment Since it had the capacitor by which parallel connection was carried out to the primary coil of a pulse transformer, the switch element which open and close the discharge path from a capacitor to a primary coil, and the resistance connected to a serial or juxtaposition at a primary coil Between a magnetic core and a coil (straight angle lead wire), insulating materials, such as a coil bobbin, become unnecessary, the appearance of a coil can be formed small and thinly, and it is effective in the ability to offer

the high-voltage transformer assembly which has the engine performance excellent in the thin shape. The wave of the high-voltage pulse outputted from the secondary coil of a pulse transformer can be made into the wave near a fundamental wave, and since it can be promptly completed by vibration of an electrical potential difference, the stress concerning passive circuit elements, such as a capacitor, is eased, and vibration of an electrical potential difference is controlled by loss of the resistance which carried out parallel connection to the primary coil, and, moreover, it is effective in the ability to use a pressure-proof low small and cheap thing for passive circuit elements.

[0092] the electromagnetism invention of claim 10 was indicated to be by any of claims 2-8 they are -- with the pulse transformer which consists of equipment Since it had the capacitor by which parallel connection was carried out to the primary coil of a pulse transformer, the switch element which open and close the discharge path from a capacitor to a primary coil, and the metal plate of said pulse transformer used as an open magnetic circuit arranged in an end close-attendants side at least Between a magnetic core and a coil (straight angle lead wire), insulating materials, such as a coil bobbin, become unnecessary, the appearance of a coil can be formed small and thinly, and it is effective in the ability to offer the high-voltage transformer assembly which has the engine performance excellent in the thin shape. The wave of the high-voltage pulse outputted from the secondary coil of a pulse transformer can be made into the wave near a fundamental wave, and since it can be promptly completed by vibration of an electrical potential difference, the stress concerning passive circuit elements, such as a capacitor, is eased, and vibration of an electrical potential difference is controlled by the eddy current loss produced in a metal plate, and, moreover, it is effective in the ability to use a pressure-proof low small and cheap thing for passive circuit elements.

[0093] Invention of claim 11 is set to invention of claim 10. At least Said pulse transformer, The socket section to which a mouthpiece is connected electrically and mechanically is prepared. the body of equipment which holds a capacitor and a switch element -- having -- this body of equipment -- the lamp of a discharge lamp -- the high-voltage pulse generated in the secondary coil of said pulse transformer through this socket section -- a lamp -- since it is impressed by the mouthpiece -- the lamp of a discharge lamp -- it is effective in the ability to offer the thin high-voltage transformer assembly which equipped one with the socket to which a mouthpiece is connected.

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the operation gestalt 1.

[Drawing 2] It is a sectional view same as the above.

[Drawing 3] It is the perspective view showing the operation gestalt 2.

[Drawing 4] It is an explanatory view explaining a production process same as the above.

[Drawing 5] It is the perspective view showing the operation gestalt 3.

[Drawing 6] It is the sectional view showing a busy condition same as the above.

[Drawing 7] It is the sectional view of the magnetic core in the operation gestalt 4.

[Drawing 8] It is the perspective view showing the condition in the middle of winding straight angle lead wire around a magnetic core same as the above.

[Drawing 9] It is a perspective view same as the above.

[Drawing 10] It is the perspective view showing the operation gestalt 5.

[Drawing 11] It is a sectional view same as the above.

[Drawing 12] It is the perspective view showing the operation gestalt 6.

[Drawing 13] It is the sectional view of the magnetic core in the operation gestalt 7.

[Drawing 14] It is a perspective view same as the above.

[Drawing 15] It is the perspective view showing the operation gestalt 8.

[Drawing 16] It is a sectional view same as the above.

[Drawing 17] It is the perspective view showing the operation gestalt 9.

[Drawing 18] It is a sectional view same as the above.

[Drawing 19] A magnetic core same as the above is shown, (a) is a front view and (b) is a side elevation.

[Drawing 20] It is the sectional view showing other configurations same as the above.

[Drawing 21] It is the perspective view showing the operation gestalt 10.

[Drawing 22] It is a sectional view same as the above.

[Drawing 23] It is the perspective view showing the operation gestalt 11.

[Drawing 24] It is a sectional view same as the above.

[Drawing 25] It is an explanatory view explaining a production process same as the above.

[Drawing 26] It is the perspective view showing the operation gestalt 12.

[Drawing 27] It is a sectional view same as the above.

[Drawing 28] It is the perspective view showing the operation gestalt 13.

[Drawing 29] It is the perspective view showing the operation gestalt 14 omitted in part.

[Drawing 30] It is the perspective view showing the operation gestalt 15.

[Drawing 31] It is a sectional view same as the above.

[Drawing 32] It is the perspective view of a barrel same as the above.

[Drawing 33] It is an explanatory view explaining a production process same as the above.

[Drawing 34] It is the perspective view of primary coil components same as the above.

[Drawing 35] It is an explanatory view same as the above.

[Drawing 36] It is the top view showing the operation gestalt 16.

[Drawing 37] It is a wave form chart for explanation [same as the above] of operation.

[Drawing 38] It is the outline circuitry Fig. showing the conventional high-voltage transformer

assembly.

[Drawing 39] It is a wave form chart for explanation of equipment of operation conventionally.

[Drawing 40] It is the outline circuitry Fig. showing the operation gestalt 17.

[Drawing 41] It is the outline circuitry Fig. showing other configurations same as the above.

[Drawing 42] It is the perspective view showing the operation gestalt 18.

[Drawing 43] It is a decomposition perspective view same as the above.

[Drawing 44] It is the perspective view which looked at the body same as the above from the tooth-back side.

[Drawing 45] It is the side elevation of a pulse transformer same as the above.

[Drawing 46] It is the decomposition perspective view showing the conventional example.

[Drawing 47] It is a perspective view same as the above.

[Drawing 48] It is a sectional view same as the above.

[Drawing 49] It is the perspective view of a coil bobbin same as the above.

[Description of Notations]

1 Magnetic Core

2 Straight Angle Lead Wire